CITY OF SEAL BEACH

SEWER MASTER PLAN
2018

Submitted to
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LIST OF ABBREVIATIONS

Abbreviations	Explanation
ac	Acres
acp	Asbestos Cement Pipe
amsl	Above Mean Sea Level
CCTV	Closed Circuit Televison
cfs	Cubic Feet per Second
cip	Cast Iron Pipe
CIP	Capital Improvement Program
City	City of Seal Beach
d/D	Depth to Diameter Ratio
du	Dwelling Unit
dip	Ductile Iron Pipe
fps	Feet per Second
GIS	Geographic Information System
gpcd	Gallons per Capita per Day
gpd	Gallons per Day
gpm	Gallons per Minute
HGL	Hydraulic Grade Line
hp	Horsepower
hwy	Highway
I/I	Inflow and Infiltration
KTSS	Knott Trunk Sewer System
LADWP	Los Angeles Department of Water and Power
LF	Linear Feet
mg	Million Gallons
mgd	Million Gallons per Day
NEC	National Electric Code
NFPA	National Fire Prevention Association
OCSD	Orange County Sanitation District
O&M	Operations and Maintenance
OSHA	Occupational Safety & Health Administration
PCH	Pacific Coast Highway
PHD	Peak Hour Demand
pvc	Polyvinyl Chloride
RLD	Residential Low Density
RMD	Residential Medium Density
RHD	Residential High Density
SBSD	Sunset Beach Sanitary District
tsf	Thousand Square Feet
USGS	United States Geological Survey
vcp	Vitrified Clay Pipe
VFD	Variable Frequency Drive
WDR	Waste Discharge Requirements

EXECUTIVE SUMMARY

ES-1 BACKGROUND

The City of Seal Beach was incorporated in 1915 and has been in operation under its own charter since 1964. It covers an area of 11.5 square miles in the northwest corner of Orange County. The City's total population was 24,168 in 2010 (Census information). The expected ultimate population is 24,824 (*Ref: California Dept. of Finance Demographic Research Unit, 2016*).

The Seal Beach Public Works Division provides wastewater collection service to approximately 5,000 customers in the northeast and southwest portions of the City and the Sunset Aquatic Park. The northeast region covers the College Park East area, Old Ranch Golf Course, Old Ranch Towne Center and Centex Homes. The southwest region is the area of the City located south of Westminster Avenue and mostly west of Seal Beach Boulevard. This includes the Boeing Integrated Defense Systems, Adolfo Lopez Drive, Hellman Ranch, and the areas of Bridgeport, Marina Hill, and Old Town. The City does not maintain the sewers serving the Naval Weapons Station, but accepts flows from the base at Pump Station No. 35. The remainder of the City is serviced by either the Orange County Sanitation District (OCSD), the Rossmoor/Los Alamitos Area Sewer District, or the Sunset Beach Sanitary District (SBSD).

Until 1972, Seal Beach treated and disposed of sewage generated in the City through a local wastewater treatment plant located on the southwestern edge of the City. The main trunk line carried flows west in Electric Avenue to the treatment plant. In 1972, the City demolished the sewage treatment plant and rerouted the system so that the wastewater would ultimately be treated and disposed of by the Orange County Sanitation District. The main trunk line was replaced with a 21-inch/24-inch vitrified clay pipe (VCP) interceptor sewer that carried flows east in Electric Avenue to the newly constructed Pump Station No.35. At the same time, a 16-inch ductile steel force main and 24-inch VCP gravity line were constructed in Seal Beach Boulevard from Pump Station No. 35 to the OCSD Seal Beach Pump Station at the corner of Seal Beach Boulevard and Westminster Avenue. The Seal Beach Pump Station lifts the sewage into the OCSD system where it is conveyed by gravity to Plant Number 2 in Huntington Beach for treatment and disposal.

The existing wastewater system consists of approximately 181,000 feet of gravity sewers, 780 manholes, and six existing sewer pump stations and their force mains.

ES-2 STUDY AREA

The City of Seal Beach is located along the California coastline in northwestern Orange County. It is bordered to the north by the City of Los Alamitos, and the unincorporated Rossmoor community; to the east by the Cities of Garden Grove, Westminster, and Huntington Beach; to the south by the Pacific Ocean and City of Huntington Beach; and to the northwest by the City of Long Beach (Los Angeles County).

The service area includes the areas in which the City of Seal Beach provides wastewater collection service or is tributary to one of its sewer facilities. The service area covers approximately 1,705 acres of the City's 7,551 acre area and consists of several separate sewersheds, namely Pump Station No. 35 (includes Bridgeport, Marina Hill, Old Town, and portion of Naval Weapons Station), Adolfo Lopez P.S. (includes Hellman Ranch), Boeing P.S., College Park East, Centex Homes, Old Ranch Towne Center, and Sunset Aquatic Park. The

service area does not include College Park West, Leisure World, Rossmoor, Surfside, and most of the U.S. Naval Weapons Station.

Since its incorporation in 1915, the City of Seal Beach has grown from a population of 250 to one of over 24,000. The Center for Demographic Research estimates that the total City population will increase to 24,824 by the year 2040.

Excluding the open space lying within the boundary of the Naval Weapons Station, the City is approximately 98 percent developed, or proposed for development, with a mix of residential, commercial, industrial and public land uses.

ES-3 CRITERIA

Establishing performance standards is an important part of evaluating the existing wastewater collection system, as it forms the basis for most of the system improvement recommendations. These standards include methodology for estimating wastewater flows, and minimum design standards for the collection system pipes, pump stations and force mains.

Average dry weather wastewater flows can be reasonably estimated from land use and unit flow factors, with the results then compared to measured flows. The components used to estimate design wastewater flows include unit flow factors, peaking factors, and infiltration/inflow allowances.

Collection system design standards include minimum pipe size, minimum flow velocity, and depth of flow to pipe diameter ratio. Pump station criteria includes sizing requirements for pumps, wet wells and forcemains. It also includes provisions for redundancy, emergency storage, emergency power, and remote monitoring and control.

Unit Flow Factors

For this Master Plan study, the sewage loads utilized in the hydraulic model were based on the average FY 2014-2015 pump flow data at all sewer pump stations. This data was compiled from weekly meter readings recorded by City staff.

Current sewage loads are significantly lower than the previously estimated loads developed using unit flow factors and land use information.

Peaking Factors

The adequacy of a sewage collection system is based upon its ability to convey peak flows. At any individual point in the system, peak dry weather flow is estimated by converting the total average dry weather flow upstream of the point in question to peak dry weather flow by an empirical relationship.

Peak dry weather flows used in analyzing the system are estimated from average dry weather flows and infiltration as follows:

$$Q_{pdw} = 1.85 \times Q_{adw}^{0.92} + \text{dry weather infiltration}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{adw} = Average dry weather flow in cfs

Peak wet weather flow will be determined as follows:

$$Q_{pww} = 1.35 \times Q_{pdw}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{pww} = Peak wet weather flow in cfs

Inflow and Infiltration

Inflow is the surface water that typically gains entry to the sewer system through perforated or unsealed manhole covers during rainfall events. Infiltration is defined as groundwater entering the wastewater collection system through defective pipes, pipe joints, connections, or manhole walls. Together, inflow and infiltration (I/I) can make up a substantial portion of the system loading if not properly managed.

To reduce previously identified inflow into the wastewater collection system, the City has made several improvements to the storm drain system that will reduce flooding instances, particularly along Electric Avenue and in College Park East. Other activities that could further reduce inflow include installing new manhole covers which have one vent hole and one pick hole, or cover some of the existing manhole cover openings with plugs.

The City reports that infiltration into manholes is clearly visible in College Park East. The CCTV inspections conducted in 2013 showed infiltration in a number of reaches in both Old Town and College Park East. In 2005, a comparison of flow monitoring results and water meter records also indicated that the magnitude of infiltration in College Park East was about 375 gallons per acre per day. Using the same methodology, infiltration in Bridgeport and the portions of Old Town with deeper sewers is estimated at 850 gallons per acre per day.
The flow monitoring data collected for the previous Master Plan study are now quite dated. It is therefore recommended that the City re-evaluate the magnitude of current infiltration rates in College Park East, Old Town, and Bridgeport. This could be accomplished through a separate study which compares a current flow monitoring effort to water meter use data. Ideally, this flow monitoring effort should be performed at a time of year when outdoor water use is minimized. Results from this study could be used to increase the accuracy of the hydraulic model by specifically identifying the locations where infiltration is occurring, as well as the quantities involved.

Sewer System Performance Evaluation Criteria

Sewer system performance evaluation criteria are established to ensure that the wastewater collection system can operate effectively. Each pipe segment must be capable of carrying design peak wet weather flows without surcharging the system. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

The performance of a sewer pump station is of particular importance since a failure could have far reaching ramifications. It must therefore be reliable, sized with sufficient capacity, and contain redundant and/or backup equipment. A plan must also be in place so that appropriate staff can be notified in the event of a failure.

Sewer system performance evaluation criteria is summarized in Table ES-1.

Table ES-1

Sewer System Performance Evaluation Criteria

Collection System	
Minimum Pipe Size	8-inch
Minimum Velocity	2.0 fps at average flow or;
	3.0 fps at peak flow
Flow Depth to Pipe Diameter Ratio (d/D) with Peak Dry Weather Flows	
15-inch and under	0.50
18-inch and over	0.64
Pump Station	
Pumps	▪ Minimum 2 each sized at peak flow
	▪ Minimum solids handling capacity 3”
Wet Wells	▪ Sized to limit pump cycling to less than 6 times/hr for motor HP up to 20; 4 times/hr up to 50 HP; 3 times/hr up to 75 HP; 2 times/hr 100 HP and above
	▪ Provide 30 minutes of storage at peak flow to allow response to a failure
	▪ Equipment to be maintained must be accessible without entering the structure
Ventilation	▪ 12-air changes/hour minimum in dry well and as required by NFPA 820
Controls	Redundant system. Float operated back-up controls
Emergency Power	Stationary source in locations which cannot provide 30-minute response time without overflowing. Provisions for connection of a portable power source at all other locations
Telemetry	Dialer system at all pump stations to alert personnel in the event of a station failure
Force Mains	▪ Minimum velocity 3.0 ft/sec
	▪ Minimum size 4”
	▪ Air/Vacs installed in vaults

ES-4 EXISTING COLLECTION SYSTEM

The City's existing wastewater collection system is made up of a network of gravity sewers, pump stations, and sewer force mains. The gravity system consists of approximately 181,000 feet of pipe and 800 manholes serving about 5000 customers. The majority of the gravity sewers are constructed of vitrified clay pipe with sizes ranging from 6-inches to 24-inches in diameter. There are six existing pump stations and associated force mains maintained by the City.

The City's sewer service area consists of seven major sewersheds as follows:

1. Pump Station No. 35 – includes Bridgeport, Marina Hill, Old Town, and a portion of the U.S. Naval Weapons Station
2. Adolfo Lopez Pump Station
3. Boeing Pump Station
4. Aquatic Park Pump Station
5. College Park East
6. Old Ranch Towne Centre
7. Centex Homes

The City is part of the Orange County Sanitation District's Revenue Area 3. All of the sewage generated within the City is ultimately conveyed to one of two OCSD pump stations, where it is then pumped to the OCSD interceptor system for conveyance to Plant No.2 in Huntington Beach for treatment and disposal.

ES-5 HYDRAULIC MODEL

To perform a detailed analysis of the wastewater collection system, it is essential to create a mathematical model that is capable of simulating the operating characteristics of the system. The City's hydraulic model was updated utilizing the Innovyze InfoSewer 7.6 platform, which is a GIS based computer program with the ability to perform steady state analyses of the flows in wastewater collection systems. The program also manages and maintains the database that stores the sewer analysis input and output results. Manning's Equation is used for depth of flow calculations in the gravity sewer pipes.

The wastewater collection system is modeled by entering pipe diameters, lengths, slopes, and roughness coefficients. The sewer model includes all of the City's existing manholes, sewer pipes (excluding laterals, private sewers, and sewers belonging to other agencies), sewer pump stations, and tributary area boundaries. The model identifies points of connection to regional facilities belonging to OCSD.

The model uses the average dry weather flows and determines peak flows based upon relationships specified by the user. Pumped flows and measured flows can be entered at any manhole as a fixed flow.

At the completion of a modeling run, output data is created for viewing on the screen or for printing. Output data for pipes include average and peak flow rate, velocity, pipe capacity, and ratio of flow depth to pipe diameter (d/D).

ES-6 GRAVITY SYSTEM HYDRAULIC ANALYSIS

The gravity system capacity analysis was generally conducted with the estimated peak dry weather flows. One exception to this is the 24-inch Seal Beach Boulevard Trunk Sewer. This sewer was evaluated to see if it could convey the sum of the firm capacities of Pump Station No. 35, Adolfo Lopez Pump Station, and Boeing Pump Station as applicable. This is the most conservative evaluation of this sewer line because pump station firm capacities are based on the larger of three times the average dry weather flow or 1.35 times the peak dry weather flow. Most likely, the pumped flows are attenuated by the time they reach the Seal Beach Boulevard Trunk Sewer, meaning lower flows are experienced in the sewer itself.

System Velocities

The topography of the City is generally flat and the majority of the gravity sewer lines have been designed and built with less than desirable slopes that attempt to follow the grade of the ground surface. This has resulted in a system that is velocity deficient in many areas where velocities are under 2.0 feet per second with average dry weather flows, and under 3.0 feet per second with peak dry weather flows.

It is not cost-effective or practical to correct these deficiencies until the sewer is scheduled for replacement due to a condition deficiency. In some instances, such as in College Park East, it may not be possible to correct the problem without constructing a costly pump station. This deficiency should, therefore, be noted with the understanding that the collection system will inevitably require continual maintenance and cleaning in order to flush out materials that periodically settle in the sewer lines.

Capacity Analysis

Based on the hydraulic model results, there were no pipe capacity deficiencies identified for the City's collection system. As such, no capital improvement projects directly related to capacity will be recommended in this Master Plan Update.

Future System Scenarios

It was not deemed necessary to create a hydraulic model of a build-out scenario until planned development or infill can be specifically identified. It is recommended that the Adolfo Lopez Pump Station and Boeing Pump Station sewersheds be monitored closely as conditions change to ensure that sufficient capacity remains available in these areas.

ES-7 SEWER PUMP STATIONS

The City of Seal Beach currently owns and operates six (6) sewer pump stations located throughout the City. A seventh pump station, located on the Municipal Pier, was destroyed by fire in early 2016. The Pier Pump Station will be rebuilt with insurance proceeds. The former Marina Community Center Pump Station was eliminated by constructing a gravity sewer in 2002. In addition, Aquatic Park Pump Station No.2 was removed from service when the Aquatic Park Pump Station No.1 tributary wastewater was diverted to the City of Huntington Beach system via a renovated pump station and new force main in 2005.

Table ES-2 provides a summary of the City's sewer pump stations. The existing sewer pump stations were each assessed and evaluated for condition and capacity purposes. The details of the assessments and subsequent recommendations are provided in Section 7 of this report.

Table ES-2
Sewer Pump Station Summary

Name	Type	Number of Pumps, Manufacturer, Type	Rated Conditions	Motor HP	Existing Flow (gpm)			Ultimate Flow (gpm)			Forcemain			Year Constructed
					Average Dry Weather	Peak Dry Weather	Peak Wet Weather	Average Dry Weather	Peak Dry Weather	Peak Wet Weather	Size (in)	Material	Length (ft)	
Adolfo Lopez	Submersible	(2) Torque flow Model 4x11S	200 gpm @ 89 ft TDH 1750 RPM	30	15	36	49	39	87	120	4"	PVC	1100	2005
Aquatic Park	Submersible	(2) ABS Piranha Model 35-2 Grinder	30 gpm @ 103 ft TDH 3450 RPM	5	1.6	4.6	6.4	1.6	4.6	6.4	2-2" 1-4"	PVC PVC	3,902 3,902	2005
Boeing	Submersible	(2) Wemco 6x6 ES Vortex	530 gpm @ 21 ft TDH 1170 RPM	10	27	63	89	167	334	451	8" 12"	PVC PVC	50 110	2003
8th Street	Wet Well / Dry Well	(2) Wemco Torque flow 4x11 CLCESR	290 gpm @ 22 ft TDH 1170 RPM	7.5	23	54	73	35	76	103	1-6" 1-6"	PVC PVC&Cl	391 245	2015
1st Street	Submersible	(2) Wemco	290 gpm @ 19 ft TDH 1170 RPM	3	0.9	3	4	6	16	20	4"	PVC	500	2007
Pump Station No. 35	Wet Well / Dry Well	(3) Wemco Hidrostal Model H8K-H-H4W 10x8	1500 gpm @ 97 ft TDH to 2940 gpm @ 67 ft TDH 1210 RPM	100	448	829	1119	454	839	1133	16"	DIP & PVC	4150	2006

ES-8 COLLECTION SYSTEM CONDITION ASSESSMENT

Thorough knowledge of the system's condition is essential in maximizing the useful life of this very important and significant asset in a cost effective manner. Additionally, the Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems requires the development of a rehabilitation and replacement plan to address condition deficiencies.

The City had about 165,000 feet of pipe inspected with the use of closed circuit television (CCTV) recordings in 2013. This is approximately 91 percent of the entire system.

The purpose of CCTV inspections is to determine the condition of the City's existing gravity sewers, and formulate a rehabilitation plan for the defective sewers. The inspection report database summary was used in selecting the recordings to be reviewed in detail. The pipe reaches selected for detailed review were those that showed the most severe structural problems and multiple deficiencies. Based on review of inspections, priorities are assigned to the sewer reaches. The priorities are selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of sanitary sewer overflows and leakage. The six (6) priority categories utilized in this report are as follows:

a. Severe Condition – This category primarily includes structural defects of deformed pipe, hole in pipe, broken pipe, and large joint offsets.

b. Major Condition – This category primarily includes structural defects of multiple fractures, medium joint offsets and major sags. Pipes with a large number of cracks are also included.

c. Moderate Condition – Pipes in this category have fractures, cracks, small and medium joint offsets, and sags.

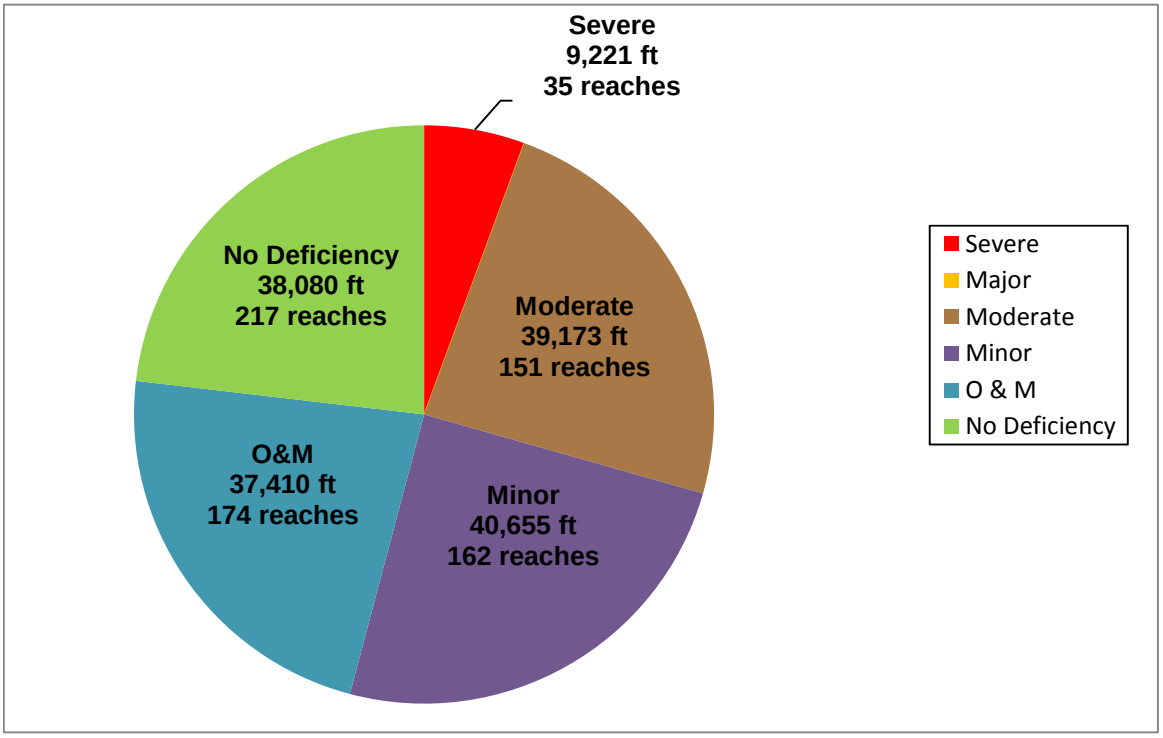
d. Minor Condition – Pipes in this category have slight sags, cracks, and small joint offsets.

e. O&M – This condition is for operational and maintenance problems and construction feature defects. There are no structural defects.

f. No Defects – This condition is for the pipe with no structural, operation and maintenance or construction feature defects.

Figure ES-1 shows the distribution of the condition priorities assigned to the pipes with completed inspections.

Figure ES-1
CCTV Inspection Priorities



A total of approximately 9,221 feet of pipe (35 reaches) is recommended for rehabilitation due to being identified as having PACP priorities of "Severe" condition. Planning level recommendations are included and are based upon the pipe defects reported in the CCTV Inspection Reports and review of select recordings. Actual improvements must be designed based upon further detailed review of each recording, taking into consideration other factors such as location, age and flow capacity of the pipe, existing utilities, and concurrent infrastructure construction projects. At a minimum, all identified locations will require spot repairs. The actual scope of work for each project should be determined through further review of the CCTV inspections.

ES-9 CAPITAL IMPROVEMENT PROGRAM

The primary goal of a Capital Improvement Program (CIP) is to provide the City with a short and long-range planning tool to implement the construction of needed infrastructure improvements in an orderly manner and provide a basis for financing of these improvements. To accomplish this goal, it is necessary to determine the estimated cost of the projects included in the capital improvement program and prioritize them to result in reliable service in a fiscally responsible manner. Funding mechanisms to finance the improvements can then be identified to implement the program.

The capital improvement projects were selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of overflows. As all system pipes and pump stations were shown to have adequate capacity, the projects identified in this section are driven solely by

the pipeline condition assessment and the field inspection of the six active pump stations, which took place on December 21, 2016.

The Capital Improvement Program is developed based upon the results of the hydraulic analyses and the established priorities. The highest priority, near-term CIP projects to be completed in the next five years are listed in Table ES-3. The remaining projects were identified to be of lower priority (with a target completion dates between 2024 and 2033) are listed in Table ES-4. Cost estimates are based on January 2018 dollars. The locations of all CIP projects are shown in and shown on Figures ES-2 and ES-3.

The recommended projects have been based upon the best information currently available. It should be updated as new information becomes available from sources such as CCTV inspections and from maintenance crew observations. The project priorities should be reviewed annually and may be revised to correspond to changed conditions, such as impending facility failures, or to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work. Some of the projects recommended are small and it may not be feasible to implement them as a single project. Therefore, several projects should be combined and bid as a package.

Pipeline replacement costs are generally more conservative and will therefore allow the City more flexibility for each project. The City of Seal Beach is largely occupied and some areas are densely populated with limited project staging capacity (such as Old Town alleys) and there are many existing utilities to consider. Therefore, the costs of replacing sewer facilities will be generally higher than in an area that is undeveloped. The pipeline construction costs are based upon $40 / diameter in / ft for typical construction in streets. If the project location is within an alley, the construction estimates are based upon replacement at $60 per diameter inch foot of pipe due to the limited access and concrete material required. Total project cost is determined by adding 40 percent of construction cost to cover engineering, inspection, administration and contingency costs.

Spot repairs are estimated at $40,000 per site in typical streets and $60,000 per site in alleys. These costs are based upon review of recent local bids for similar type work. Total project cost is determined by adding 40 percent of construction cost to cover engineering, inspection, administration and contingency costs.

Table ES-3
Capital Improvement Projects (2018-2023)

CIP Project	Sub-project ID	Up-stream Manhole ID	Down-stream Manhole ID	Description	Alley	Dia-meter (in)	Material	Qty	Unit Basis	Unit Cost	Total Estimated Cost with Pipe Replacements Implemented ($)	Spot Repair Locations	Unit Repair Cost ($)	Total Estimated Cost with Pipe Repairs Implemented ($)
1	1a	F02-269	F02-269A	4th St Alley Repair/Replace	Y	8	VCP	305	LF	$ 480	$ 204,960	2	$ 60,000	$ 168,000
	1b	F05-312	F02-311	7th St Alley Repair/Replace (2 seg)	Y	8	PVC	594	LF	$ 480	$ 399,168	1	$ 60,000	$ 84,000
	1c	F03-301	F03-266A	5th St Alley Repair/Replace	Y	8	VCP	340	LF	$ 480	$ 228,480	2	$ 60,000	$ 168,000
	1d	F06-316	F06-315A	8th St Alley Repair/Replace	Y	8	VCP	258	LF	$ 480	$ 173,376	2	$ 60,000	$ 168,000
	1e	F28-386A	F28-384	Main St Alley Repair/Replace	Y	8	VCP	220	LF	$ 480	$ 147,840	1	$ 60,000	$ 84,000
	1f	F04-307	F04-306	6th St Alley Repair/Replace	Y	8	VCP	308	LF	$ 480	$ 206,976	1	$ 60,000	$ 84,000
	1g	F15-320	F06-C319	8th St Repair/Replace	N	8	VCP	169	LF	$ 320	$ 75,712	1	$ 40,000	$ 56,000
	1h	F01-C295	F01-294	2nd St Alley Repair/Replace	Y	8	VCP	240	LF	$ 480	$ 161,280	1	$ 60,000	$ 84,000
	1i	F10-344A	F10-344	11th St Alley Repair/Replace	Y	8	VCP	354	LF	$ 480	$ 237,888	1	$ 60,000	$ 84,000
	1j	F06-317	F06-316A	8th St Alley Repair/Replace	Y	8	VCP	273	LF	$ 480	$ 183,456	1	$ 60,000	$ 84,000
	1k	F09-340	F09-339	12th St Alley Repair/Replace	Y	8	VCP	129	LF	$ 480	$ 86,688	1	$ 60,000	$ 84,000
	1l	F15-C372	F15-371	East Seal Way Repair/Replace	N	8	VCP	600	LF	$ 320	$ 268,800	1	$ 40,000	$ 56,000
	Subtotal							**3,790**			**$ 2,374,624**			**$ 1,204,000**
2	2a	D06-151	D05-138	Bolsa Ave Repair/Replace	N	10	VCP	246	LF	$ 400	$ 137,760	1	$ 40,000	$ 56,000
	2b	D02-115 & D02-114	D02-113	Avalon & Crestview Repair/Replace (2 seg,)	N	8	VCP	440	LF	$ 320	$ 197,120	2	$ 40,000	$ 112,000
	2c	D05-132	D05-130	Coastline Dr Repair/Replace	N	12	VCP	285	LF	$ 480	$ 191,520	1	$ 40,000	$ 56,000
	2d	D02-102	D02-099	Carmel Ave Repair/Replace	N	8	VCP	330	LF	$ 320	$ 147,840	1	$ 40,000	$ 56,000
	2e	D09-193	D09-192	Catalina Ave Repair/Replace	N	8	VCP	356	LF	$ 320	$ 159,488	1	$ 40,000	$ 56,000
	2f	D03-119	D03-117	Marvista Ave Repair/Replace (2 seg)	N	8	VCP	544	LF	$ 320	$ 243,712	2	$ 40,000	$ 112,000
	2g	D07-176	D07-175	Beachcomber Dr Repair/Replace	N	8	VCP	259	LF	$ 320	$ 116,032	1	$ 40,000	$ 56,000
	2h	D05-134	D05-133	Fathom Ave Repair/Replace	N	8	VCP	193	LF	$ 320	$ 86,464	1	$ 40,000	$ 56,000
	2i	D08-188	D08-187	Bayou Way Repair/Replace	N	8	VCP	151	LF	$ 320	$ 67,648	1	$ 40,000	$ 56,000
	2j	D04-150	D04-146	Catalina Ave Repair/Replace	N	8	VCP	353	LF	$ 320	$ 158,144	1	$ 40,000	$ 56,000
	2k	D04-144	D04-143	Balboa Dr Repair/Replace	N	8	VCP	242	LF	$ 320	$ 108,416	1	$ 40,000	$ 56,000
	2l	D08-182	D08-180	Bayside Dr Repair/Replace	N	8	VCP	215	LF	$ 320	$ 96,320	1	$ 40,000	$ 56,000
	2m	D07-170	D07-169	Sea Breeze Dr Repair/Replace	N	8	VCP	354	LF	$ 320	$ 158,592	1	$ 40,000	$ 56,000
	2n	D04-142	D04-128	Driftwood Ave Repair/Replace	N	8	VCP	341	LF	$ 320	$ 152,768	1	$ 40,000	$ 56,000
	2o	E07-219	E07-218	Riviera Dr Repair/Replace	N	8	VCP	253	LF	$ 320	$ 113,344	1	$ 40,000	$ 56,000
	2p	D08-186	D08-185	Harbor Way Repair/Replace	N	8	VCP	148	LF	$ 320	$ 66,304	1	$ 40,000	$ 56,000
	2q	D06-155	D06-154	South Shore Dr Repair/Replace	N	8	VCP	151	LF	$ 320	$ 67,648	1	$ 40,000	$ 56,000
	Subtotal							**4,861**			**2,269,120**			**$ 1,064,000**
3	3a	B07-G01	B07-A23	Dogwood Ave Repair/Replace	N	8	VCP	122	LF	$ 320	$ 54,656	Replace		$ 54,656
	3b	B16-J16	B16-A45	Wisteria St Repair/Replace	N	8	VCP	268	LF	$ 320	$ 120,064	1	$ 40,000	$ 56,000
	3c	U02-E20	U02-E19	Apollo Ct Lateral Repair/Replace	N	8	VCP	182	LF	$ 320	$ 81,536	1	$ 40,000	$ 56,000
	Subtotal							**572**			**$ 256,256**			**$ 166,656**
4	-	-	-	**Adolfo Lopez Pump Station**										
				Construct Parallel Force Main - Next 5 years	N	6	PVC	1,100	LF	$ 200	$ 308,000	-	-	$ 308,000
				Subtotal - Adolfo Lopez Pump Station							***$ 308,000***	***-***	***-***	***$ 308,000***
5	-	-	-	**Boeing Pump Station**										
				Connect to SCADA System				1	LS	$ 60,000	$ 84,000	-	-	$ 84,000
				Construct Parallel Force Main - Next 5 years	N	10	PVC	160	LF	$ 400	$ 90,000	-	-	$ 90,000
				Subtotal - Boeing Pump Station							***$ 174,000***	***-***	***-***	***$ 174,000***
6	-	-	-	**8th Street Pump Station**										
				Construct Canopy Over Electrical Enclosures - Next 5 Years				1	LS	$ 60,000	$ 84,000	-	-	$ 84,000
				Subtotal - 8th Street Pump Station							***$ 84,000***	***-***	***-***	***$ 84,000***
7	-	-	-	**1st Street Pump Station**										
				Raise Electric Cabinets - Next two years				1	LS	$ 50,000	$ 70,000	-	-	$ 70,000
				Reline Wet Well - Next 2 years				1	LS	$ 20,000	$ 28,000	-	-	$ 28,000
				Subtotal - 1st Street Pump Station							***$ 98,000***	***-***	***-***	***$ 98,000***
8	-	-	-	Install Smart Manhole Covers at Potential Overflow Sites				12	EA	$ 5,000	$ 84,000	-	-	$ 84,000
9	-	-	-	Evaluate infiltration/inflow in College Park East, Old Town, and Bridgeport				1	LS	$120,000	$ 168,000	-	-	$ 168,000
10	-	-	-	Survey All Sewers and Update Hydraulic Model				1	LS	$150,000	$ 210,000	-	-	$ 210,000
TOTAL REPLACEMENT COST (2018-2023)											***$ 6,026,000***	***TOTAL EST. COST (2018-2023)***		***$ 3,560,656***

Pipe Unit Cost is based on $40/diameter-inch (Alley costs increased by 50%)

*Construction Cost = Unit Cost * Qty*

Engineering, Administration, Contingencies = 40% of Construction Cost

Total Cost = Construction Cost + Engineering, Administration, Contingencies

Table ES-4
Capital Improvement Projects (2024-2033)

CIP Project	Description	Qty	Unit Basis	Unit Cost	Total Cost ($)
11	**Adolfo Lopez Pump Station**				
	Replace Mechanical and Electrical Equipment - 2025	1	LS	$ 600,000	$ 840,000
	Replace Wet Well Piping - 2025	1	LS	$ 70,000	$ 98,000
	Site Improvements - 2025	1	LS	$ 50,000	$ 70,000
	Replace Standby Generator - 2030	1	LS	$ 150,000	$ 210,000
	Subtotal Adolfo Lopez Pump Station				**$ 1,218,000**
12	**Aquatic Park Pump Station**				
	Replace Pump Station if not Transferred to Huntington Beach	1	LS	$ 1,000,000	$ 1,400,000
	Subtotal - Aquatic Park Pump Station				***$ 1,400,000***
13	**Boeing Pump Station**				
	Replace Mechanical and Electrical Equipment - 2023	1	LS	$ 600,000	$ 840,000
	Replace Wet Well Piping - 2023	1	LS	$ 80,000	$ 112,000
	Replace Standby Generator - 2033	1	LS	$ 150,000	$ 210,000
	Subtotal - Boeing Pump Station				***$ 1,162,000***
14	**8th Street Pump Station**				
	Replace Cast Iron Force Main - 2025	N	6	PVC	150 LF $ 240 $ 51,000
	Extend New Force Main - 2025	N	6	PVC	185 LF $ 300 $ 78,000
	Subtotal - 8th Street Pump Station				***$ 129,000***
15	**1st Street Pump Station**				
	Construct Parallel Force Main - 2027	N	4	PVC	500 LF $ 120 $ 84,000
	Replace Mechanical and Electrical Equipment - 2027				1 LS $ 200,000 $ 280,000
	Replace Valve Vault, Valves and Meter - 2027				1 LS $ 100,000 $ 140,000
	Replace Influent Sewers - 2027 or when paving is replaced				350 LF $ 180 $ 88,800
	Subtotal - 1st Street Pump Station				***$ 592,800***
16	**Pump Station No.35**				
	Replace Pumps with Close Coupled Units - 2028				3 EA $ 150,000 $ 630,000
	Construct Natural Gas Standby Generator with ATS - 2028				1 LS $ 360,000 $ 504,000
	Replace the Electrical and Control Equipment - 2028				1 LS $ 600,000 $ 840,000
	Construct Parallel Force Main - 2025	N	16	DI	4,150 LF $ 640 $ 3,719,000
	Subtotal - Pump Station No.35				***$ 5,693,000***
TOTAL REPLACEMENT COST (2024-2033)					***$10,194,800***

Pipe Unit Cost is based on $40/diameter-inch (Alley costs increased by 50%)

*Construction Cost = Unit Cost * Qty*

Engineering, Administration, Contingencies = 40% of Construction Cost

Total Cost = Construction Cost + Engineering, Administration, Contingencies

OCSD Seal Beach P.S.

Westminster Blvd

Westminster Av

Boeing P.S. CIP 5, 13

3c

City of Long Beach

Adolfo Lopez P.S. CIP 4, 11

Adolfo Lopez Dr

Seal Beach Blvd

Heron Pt

U.S. NAVAL WEAPONS STATION

2b Crestview Av

2d Catalina Av

2j Catalina Av 2e

2f Mar Vista Av

2k 2g 2i

Driftwood Pl 2n

2o Southshore Dr

Taper Dr

Sandpiper Dr

Beachcomber Dr

2m Sea Breeze Dr

Islandview Dr

2l Bayside Dr

2p Harbor Wy

2h Fathom Av

2c Coastline Dr

2a

P.S. #35 FM CIP 16

Marina Dr

Marina Dr

1st St

2nd St

3rd St

4th St

5th St

6th St

7th St

8th St

9th St

Main St

10th St

11th St

12th St

13th St

14th St

15th St

16th St

17th St

1h 1a 1c 1b 1d 1e 1f 1g 1i 1k 1j 1l

2g

Balboa Dr

Crystal Pl

Electric Av

Dolphin Av

Ocean Av

1st St P.S. CIP 7, 15

8th St P.S. CIP 6, 14

Pacific Ocean

Pier P.S. (to be rebuilt)

P.S. #35 CIP 16

Seal Beach Blvd

Pacific Coast Hwy

NATIONAL WILDLIFE REFUGE

Aquatic Park P.S. CIP 12

Legend

- City Sewer Pump Station
- OCSD Sewer Pump Station
- Forcemain
- OCSD Trunk Sewers
- CIP Improvement Project Location
- City Sewer
- City Boundary

N

0 625 1,250 2,500 Feet

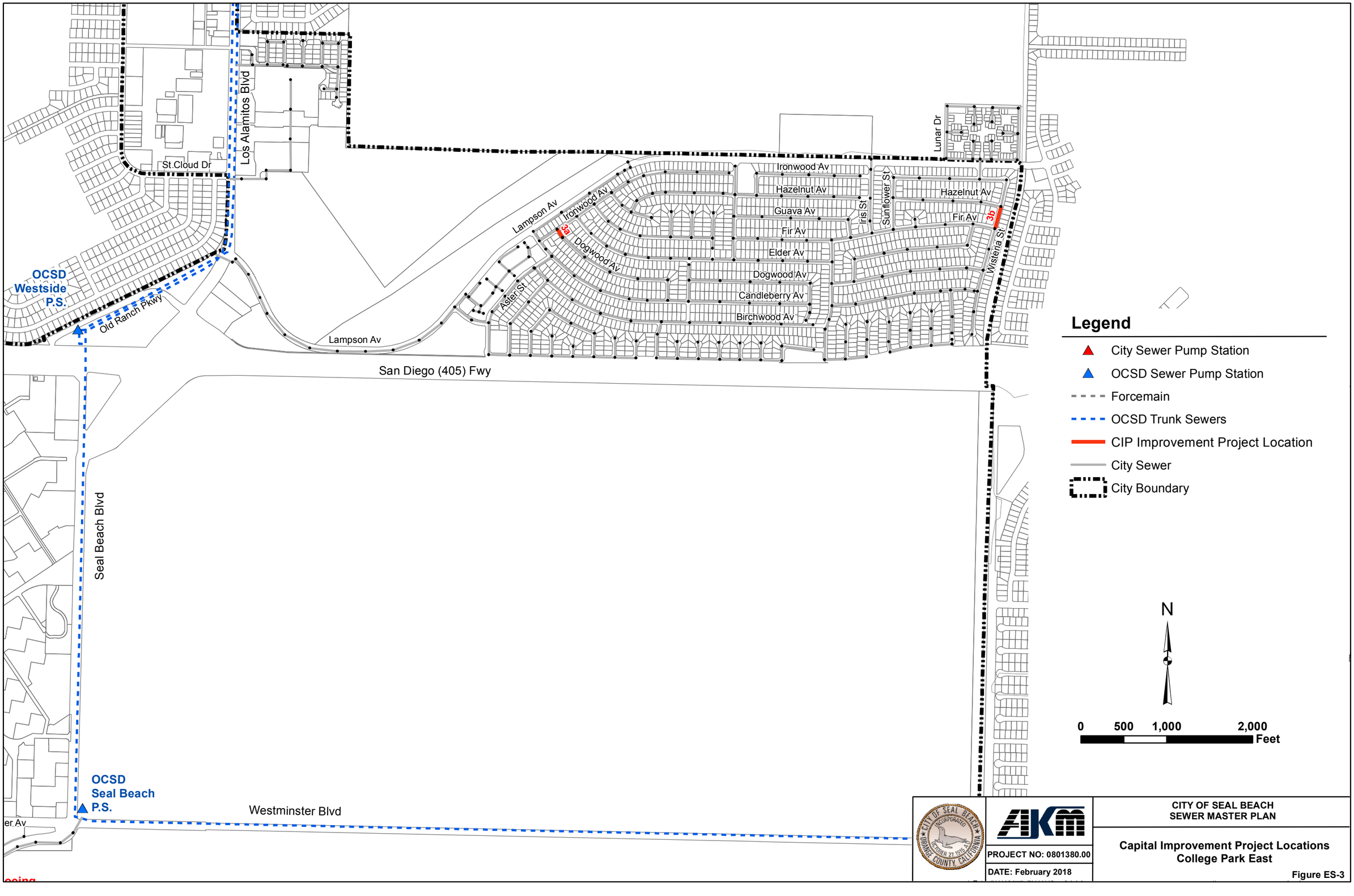
CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

Capital Improvement Project Locations
Boeing, Adolfo Lopez, and P.S. 35 Sewersheds

Figure ES-2


St Cloud Dr
Los Alamitos Blvd
Lunar Dr
Ironwood Av
Hazelnut Av
Guava Av
Fir Av
Elder Av
Dogwood Av
Candleberry Av
Birchwood Av
Iris St
Sunflower St
Wisteria St
Lampson Av
Aster St
3a
3b
OCSD
Westside
P.S.
Old Ranch Pkwy
San Diego (405) Fwy
Seal Beach Blvd
OCSD
Seal Beach
P.S.
Westminster Blvd
er Av
Legend
City Sewer Pump Station
OCSD Sewer Pump Station
Forcemain
OCSD Trunk Sewers
CIP Improvement Project Location
City Sewer
City Boundary
N
0
500
1,000
2,000
Feet
CITY OF SEAL BEACH
SEWER MASTER PLAN
Capital Improvement Project Locations
College Park East
PROJECT NO: 0801380.00
DATE: February 2018
Figure ES-3

SECTION 1
INTRODUCTION

1-1 BACKGROUND

The City of Seal Beach was incorporated in 1915 and has been in operation under its own charter since 1964. It covers an area of 11.5 square miles in the northwest corner of Orange County. The City's total population was 24,168 in 2010 (Census information). The expected ultimate population is 24,824 (*Ref: California Dept. of Finance Demographic Research Unit, 2016*).

Originally called Bay City, Seal Beach was developed in the early 1900's as a resort destination for residents of the Los Angeles area. Its early growth was accelerated by the construction of the Pacific Electric Railway Trolley, which reached the City in 1906. The railway allowed visitors to reach the City more easily and in greater numbers to enjoy the many hotels, bathhouses and dance halls which were constructed for their recreation. In 1926, oil was discovered in the City, and the oil boom that followed resulted in the development of Seal Beach into the residential community it is today.

The City is divided into several distinct communities as described in the following subsections.

Old Town

Old Town, which is the area south of Electric Avenue and Marina Drive, between 1st Street and Seal Beach Boulevard, was developed in the 1920's and is the oldest area within the City's corporate limits. High density residential and commercial land uses are prevalent in this area. Large single-family residential lots located directly on the beach are found in the Gold Coast District. The City's mile long beach in Old Town is used for surfing and swimming. The Seal Beach Pier, located at the end of Main Street, provides fishing facilities and a restaurant.

Bridgeport

Bridgeport is the area located west of Pacific Coast Highway and north of Marina Drive. It was primarily developed in the 1960's and consists of medium density and high density residential land uses (Oakwood Apartments and Seal Beach Mobile Home Park).

Marina Hill

Marina Hill was developed in the 1950's and consists of single-family homes. This area is located north of Pacific Coast Highway, adjacent to the southerly edge of the Hellman Ranch property.

Surfside

Surfside, a colony which was incorporated in the 1930's, became a part of Seal Beach in 1969. The area consists of single-family homes located on the south spit of Anaheim Bay. Although Surfside is a gated community, pedestrian and bicycle access to the beach is available and it is a popular location for surfing and swimming.

College Park East and West

College Park East and West were both developed in the late 1960's. They are single-family residential communities located north of the San Diego Freeway.

The Leisure World Retirement Community

The Leisure World Retirement Community is located between Westminster Boulevard and the San Diego Freeway west of Seal Beach Boulevard. It was built in 1961 and is a gated community of 1200 acres. Leisure World includes 6482 cooperative apartments and 126 condominiums housing an approximate population of 9000. Leisure World provides a secure, serene environment for seniors 55 and older. Medical, religious, commercial and recreational facilities are all provided within the compound limits.

Boeing Integrated Defense Systems

Boeing Integrated Defense Systems occupies 107 acres southwest of Seal Beach Boulevard and Westminster Avenue. The plant manufactures satellites, and has laboratory and testing facilities to support Boeing's space program. Engineering and design operations are also conducted from this facility. The remaining land will be developed as a business park combined with hotel, commercial, and light industrial uses.

Hellman Ranch

Hellman Ranch occupies 231-acre parcel of land located west of Seal Beach Boulevard, just north of the Marina Hill Community. It consists of approximately 65 single-family residences, the Gum Grove Nature Park, public access, oil extraction, saltwater marsh wetlands, and freshwater wetlands.

Anaheim Bay

Anaheim Bay, once part of an extensive system of coastal marshes, consists of an outer harbor formed by jetties, an inner harbor dredged to accommodate oceangoing ships, and a wetland system of salt marshes and tidal channels. In 1944, the U.S. Navy acquired 5,256 acres (including the Wildlife Refuge) of the Bay and adjoining property for construction of the Naval Weapons Station. This is the largest land use within the City's limits.

The Seal Beach National Wildlife Refuge

The Seal Beach National Wildlife Refuge was established in 1972 and preserves 920 acres of salt marsh and upland area in Anaheim Bay. The refuge is located within the boundaries of the U.S. Naval Weapons Station and there is no public access.

Sunset Aquatic Park

Sunset Aquatic Park was acquired by the County in 1962 from the U.S. Navy. It encompasses 67 acres of Anaheim Bay and is the site of a public marina and park.

1-2 WASTEWATER SERVICE

The Seal Beach Public Works Division provides wastewater collection service to approximately 5,000 customers in the northeast and southwest portions of the City and the Sunset Aquatic Park. The northeast region covers the College Park East area, Old Ranch Golf Course, Old Ranch Towne Center and Centex Homes. It is bounded by the San Diego Freeway to the south, Bolsa Chica Channel to the east, the Armed Forces Reserve Center to the north, and Seal Beach Boulevard to the west. The predominant land use in College Park East and Centex Homes is residential low density (RLD) housing. The Old Ranch Towne Center is a commercial area.

The southwest region is the area of the City located south of Westminster Avenue and mostly west of Seal Beach Boulevard. This includes the Boeing Integrated Defense Systems, Adolfo Lopez Drive, Hellman Ranch, and the areas of Bridgeport, Marina Hill, and Old Town. The City does not maintain the sewers serving the Naval Weapons Station, but accepts flows from the base at Pump Station No. 35.
The remainder of the City is serviced by either the Orange County Sanitation District (OCSD), the Rossmoor/Los Alamitos Area Sewer District, or the Sunset Beach Sanitary District (SBSD).

Until 1972, Seal Beach treated and disposed of sewage generated in the City through a local wastewater treatment plant located on the southwestern edge of the City. The main trunk line carried flows west in Electric Avenue to the treatment plant. In 1972, the City demolished the sewage treatment plant and rerouted the system so that the wastewater would ultimately be treated and disposed of by the Orange County Sanitation District. The main trunk line was replaced with a 21-inch/24-inch vitrified clay pipe (VCP) interceptor sewer that carried flows east in Electric Avenue to the newly constructed Pump Station No.35. At the same time, a 16-inch ductile steel force main and 24-inch VCP gravity line were constructed in Seal Beach Boulevard from Pump Station No. 35 to the OCSD Seal Beach Pump Station at the corner of Seal Beach Boulevard and Westminster Avenue. The Seal Beach Pump Station lifts the sewage into the OCSD system where it is conveyed by gravity to Plant Number 2 in Huntington Beach for treatment and disposal.

The existing wastewater system consists of approximately 181,000 feet of gravity sewers, 780 manholes, and six existing sewer pump stations and their force mains.

1-3 PREVIOUS STUDIES

The City of Seal Beach's first comprehensive Sewer System Master Plan was completed in 1999. It developed service criteria, evaluated the capacity of the then existing system, identified future capacity deficiencies, and recommended a capital improvement program to relieve the existing and future capacity deficiencies. Additionally, the 1999 Master Plan evaluated the condition and capacity of the nine sewer pump stations that existed at the time. It recommended the elimination of two pump stations, and improvements to the remaining seven to ascertain that these critical facilities provide proper service.

The City of Seal Beach updated its sewer rate structure in 2001. The new structure included a Capital Fund Fee to provide dedicated revenues for constructing the facilities recommended by the Master Plan.

In 2005, the City performed an update of the Sewer System Master Plan. Forty-one capital improvements projects were recommended for implementation as a result of this study.

Since 2005, the City has implemented many of the recommended improvements, including:

- Replacement of the Lampson Avenue trunk line
- Electrical and control system upgrades at Pump Station No. 35
- Replacement of gravity sewers in College Park East on Lampson Avenue, Candleberry Avenue, Ironwood Avenue, Elder Avenue, and Basswood Street
- 1st Street Pump Station Improvements

- Replacement of the 8th Street Pump Station
- Replacement of Ocean Avenue Alley gravity sewers
- Replacement of Boeing Pump Station
- Replacement of Adolfo Lopez Pump Station

1-4 STATEWIDE GENERAL WASTE DISCHARGE REQUIREMENTS

The State Water Resources Control Board (SWRCB), which oversees all wastewater permitting and enforcement, adopted Resolution 2004-80 requiring staff to work with stakeholders in developing a regulatory program that will provide a consistent approach for reducing sanitary sewer overflows (SSOs). To assist in the development of the regulatory program, a statewide SSO Guidance Committee composed of representatives from the Regional Water Quality Control Boards, county environmental health departments, environmental groups, U.S. EPA, local public collection system owners and other collection system experts was formed. SWRCB staff and the SSO Guidance Committee drafted Statewide General Waste Discharge Requirements (WDR) for Sewage Collection System Agencies.

The State Water Resources Control Board adopted the Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems and the associated monitoring and reporting program by issuing Order No. 2006-0003 on May 2, 2006.

The WDR and reporting program addresses SSO reporting and proper collection system management and operation necessary to protect the public health, water quality, the environment, and the public's investment in the sewer system infrastructure.

The fifth paragraph of the preamble to the Waste Discharge Requirements is:

> "To facilitate proper funding and management of sanitary sewer systems, each Enrollee must develop and implement a system-specific Sewer System Management Plan (SSMP). To be effective, SSMPs must include provisions to provide proper and efficient management, operation, and maintenance of sanitary sewer systems, while taking into consideration risk management and cost benefit analysis. Additionally, an SSMP must contain a spill response plan that establishes standard procedures for immediate response to an SSO in a manner designed to minimize water quality impacts and potential nuisance conditions."

The Sewer System Management Plan must address the following elements:

1. Goals
2. Organization Structure
3. Legal Authority
4. Operation and Maintenance Program, including a Preventive Maintenance Program and a Rehabilitation and Replacement Program
5. Design and Performance Provisions
6. Overflow Emergency Response Plan

7. Fats, Oils, and Grease (FOG) Control Program
8. System Evaluation and Capacity Assurance Plan (SECAP)
9. Monitoring, Measurement, and Program Modifications
10. Sewer System Management Plan Program Audits
11. Communication Program

The Waste Discharge Requirements define a sanitary sewer system as, "Any system of pipes, pump stations, sewer lines, or other conveyances, upstream of a Wastewater Treatment Plant headworks used to collect and convey wastewater to the publicly owned treatment facility. Temporary storage and conveyance facilities (such as vaults, temporary piping, construction trenches, wet wells, impoundments, tanks, etc.) are considered to be part of the sanitary sewer system, and discharges into these temporary storage facilities are not considered to be SSOs"

Enrollees are required to certify that the final SSMP and its constituent subparts are in compliance with the Sanitary Sewer Order within the time frame above. Enrollees are also required to obtain their governing board's approval of the SSMP Development Plan and Schedule and final SSMP at a public hearing prior to certification as complete and in compliance. Enrollees do not send their SSMP to the State or Regional Water Boards for review or approval, but need to make them available upon request.

1-5 GOVERNMENT ACCOUNTING STANDARDS BOARD STATEMENT 34 (GASB 34)

Government Accounting Standards Board Statement 34 (GASB 34), issued in June 1999, requires that agencies have an asset management system in place. They must establish the condition in which they will maintain their assets, assess the condition of their infrastructure, estimate the useful lives and replacement costs, and determine the cost to maintain the desired condition of the infrastructure. Complying with Statement 34 will provide agencies with the necessary tools for maintaining the integrity of their assets, and will most likely improve their bond rating.

1-6 OBJECTIVE

The purpose of this study is to provide the City of Seal Beach with a comprehensive Sewer System Master Plan Update. The Update will include an assessment of the condition and capacity of the collection system and all pump stations, as well as a capital improvement program with current cost estimates for eliminating the deficiencies identified. The products of the study will be used to meet the requirements of Order No. 2006-0003. The recommended capital improvement program and the operational needs of the system will be utilized in conducting financial studies and developing a funding mechanism for a sustainable Sewer Enterprise Fund.

SECTION 2
STUDY AREA

2-1 PURPOSE

This section describes the study area of the Sewer Master Plan, existing land uses within the study area, and population estimates for present day and ultimate build-out. This information, along with recent pump station flow data, is utilized in the subsequent sections to estimate current system loads.

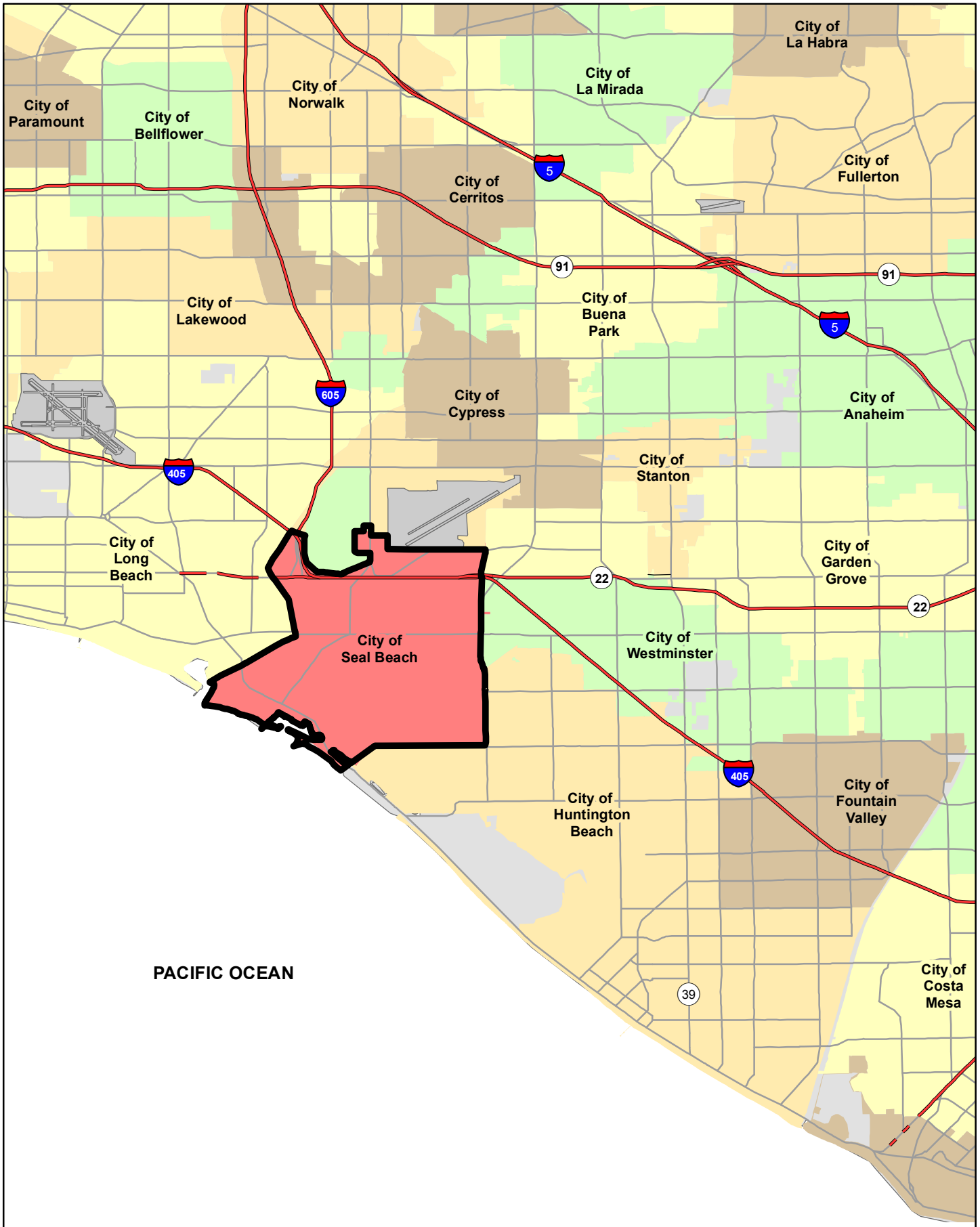
2-2 LOCATION

The City of Seal Beach is located along the California coastline in northwestern Orange County. It is bordered to the north by the City of Los Alamitos, and the unincorporated Rossmoor community; to the east by the Cities of Garden Grove, Westminster, and Huntington Beach; to the south by the Pacific Ocean and City of Huntington Beach; and to the northwest by the City of Long Beach (Los Angeles County). Figure 2-1 shows the location of the City of Seal Beach and the neighboring communities.

2-3 SERVICE AREA

The service area includes the areas in which the City of Seal Beach provides wastewater collection service or is tributary to one of its sewer facilities. The service area covers approximately 1,705 acres of the City's 7,551 acre area and consists of several separate sewersheds shown in Figure 2-2 and described below.

1. **Pump Station No. 35 Sewershed:** Bridgeport, Old Town, Marina Hill North, Marina Hill South and the southwesterly portion of the U.S, Naval Weapons Station drain to Pump Station No. 35, located east of Seal Beach Boulevard and north of Electric Avenue
2. **Adolfo Lopez P.S Sewershed:** Hellman Ranch, properties along Adolfo Lopez Drive, and the southern portion of Boeing Integrated Defense Systems drain to the Adolfo Lopez Pump Station located in the City's Maintenance Yard, south of Adolfo Lopez Drive
3. **Boeing P.S. Sewershed:** The northern portion of Boeing Integrated Defense Systems and the commercial area located south of Westminster Avenue and west of Seal Beach Boulevard drain to the Boeing Pump Station located west of Seal Beach Boulevard and south of Westminster Avenue
4. **College Park East Sewershed:** College Park East, the Old Ranch Golf Course, and the commercial properties south of Lampson Avenue and east of Seal Beach Boulevard drain to Orange County Sanitation District's Los Alamitos Sub-Trunk Sewer at the intersection of Lampson Avenue and Seal Beach Boulevard.
5. **Old Ranch Towne Center Sewershed:** Old Ranch Towne Center, located east of Seal Beach Boulevard and north of Lampson Avenue drains to Orange County Sanitation District's West Side Relief Interceptor in Seal Beach Boulevard.
6. **Centex Homes Sewershed:** Centex Homes, located north of Old Ranch Towne Center drains to OCSD's West Side Relief Interceptor at Seal Beach Boulevard and Plymouth Drive
7. **Sunset Aquatic Park Sewershed:** Sunset Aquatic Park drains to the Aquatic Park Pump Station, which pumps the wastewater to the City of Huntington Beach's system.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Location Map

Project No: 11316.00

Date: February 2018

Figure 2-1

Each of the service area sewersheds lies entirely within the corporate boundaries of Seal Beach, with the exception of the College Park East/Lampson sewershed. A small residential housing tract located north of Lampson Avenue and west of Bolsa Chica Channel, which is in the City of Los Alamitos, drains into the College Park East/Lampson system at Tulip Street and Lampson Avenue.

The Leisure World Retirement Community is served directly by the Orange County Sanitation District (OCSD). The southern portion of the community drains into Orange County Sanitation District's Seal Beach Interceptor in Seal Beach Boulevard, which terminates at the Seal Beach Pump Station. The remainder drains to the north across the 405 Freeway into Los Alamitos Sub-Trunk.

The Rossmoor Center commercial area, located north of the San Diego Freeway and west of Seal Beach Boulevard, are served by the Rossmoor/Los Alamitos Area Sewer District.

The Rossmoor-Los Alamitos Area Sewer District serves most of the College Park West community with the exception of the sewers in Loyola Plaza and College Park Drive, between Loyola Plaza and Harvard Lane, which are maintained by the City (not included in this study).

Surfside, a coastal residential community, south of Pacific Coast Highway and east of Seal Beach Boulevard, is served by the Sunset Beach Sanitary District (SBSD).

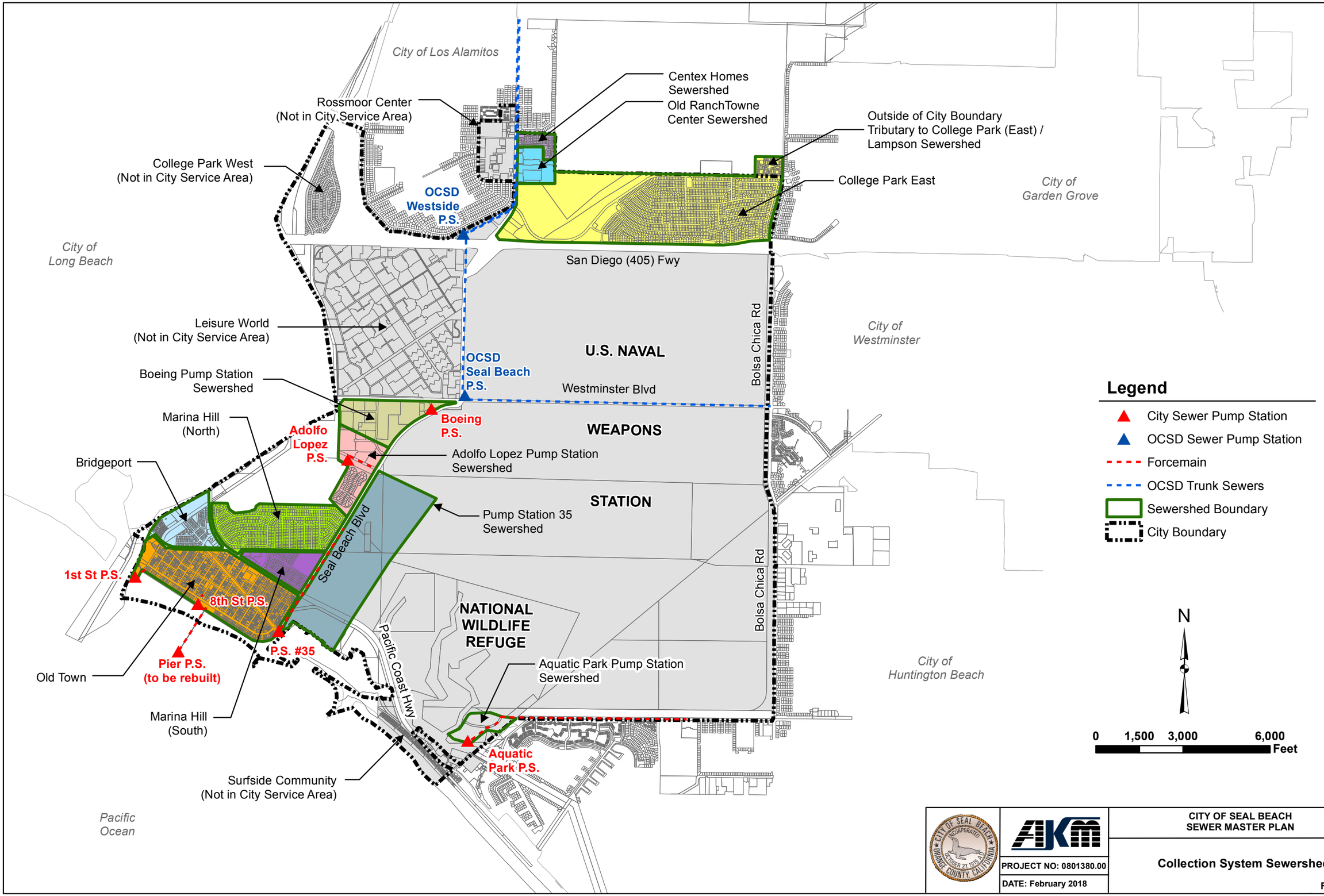
2-4 TOPOGRAPHICAL DESCRIPTION

The majority of the City is located within an alluvial plain that extends southward from the convergence of Coyote Creek and the San Gabriel River. The two channels drain from the northeast and north respectively and the combined flow reaches the ocean at the Alamitos Gap. Landing Hill (located within Seal Beach), Alamitos Heights (in Long Beach), and Bolsa Chica Mesa (in Huntington Beach), consist of uplifted blocks within the Newport-Inglewoood fault zone, and are the major topographic features within and near the City.

Ground surface elevations in the study area vary between sea level at the Pacific Ocean and 54 feet above mean sea level (amsl) at Landing Hill (Marina Hill North). The highest elevations in the Old Town area are found along Ocean Avenue between Second Street and Main Street (26 feet amsl). Areas adjacent to this point either slope north and east towards Electric Avenue or south and west towards the Pacific Ocean. The remaining portions of Old Town, Bridgeport, and Marina Hill South are very flat, which seems to have resulted in the construction of sewage facilities with minimal slopes.

Hellman Ranch, the Adolfo Lopez sewershed, and western portions of the Boeing Integrated Defense Systems (also known as Pacific Gateway Business Center) property slope towards the west end of Adolfo Lopez Drive. Elevations vary from 40 feet amsl in Hellman Ranch to 6 feet amsl between the City's Maintenance Yard and the Animal Shelter.

The eastern portion of the Boeing Integrated Defense Systems property slopes east towards Seal Beach Boulevard. The elevations in this area vary from 27 feet to 9 feet amsl. The western portions of this area slope west and south towards the San Gabriel River.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Collection System Sewersheds

PROJECT NO: 0801380.00

DATE: February 2018

Figure 2-2

The College Park East area slopes southwesterly from 23 feet amsl at Lampson Avenue and Bolsa Chica Channel to 16 feet at Lampson Avenue and Basswood Street.

The Old Ranch Towne Center and Centex Homes generally slope from east to west towards Seal Beach Boulevard. Elevations vary from 15 feet to 12 feet amsl.

2-5 GEOTECHNICAL INFORMATION

The predominant soil classifications found within each of the major regions of the City's service area are shown in Table 2-1.

Table 2-1
Soil Classifications within Service Area

Service Area Region	Soil Classification Hydrologic Group
Bridgeport	B
College Park East - East Residential Area	C
College Park East - West Residential Area	B
College Park East – Golf Course	C
Marina Hill	D
Old Town	B
U.S. Naval Weapons Station	C
Future Hellman Ranch Site & Boeing Facility	C & D

Group B soils are generally well drained sandy loam, having moderate infiltration and water transmission rates. Group C soils are mostly silty-loam with slow infiltration and water transmission rates. Group D soils consist primarily of clays which have very slow infiltration rates when thoroughly wetted.

The soils with higher infiltration rates permit better passage of water through them to the groundwater table. Sewer lines constructed in Group B soils would therefore be more susceptible to infiltration through defective pipe joints and manholes than Group C soils. Sewers located in Group D soils would have the least susceptibility to infiltration.

High groundwater is prevalent throughout the City. Groundwater levels in the Old Town, and Bridgeport areas are at approximately elevation +3.0 feet amsl. Sewers with inverts below this elevation are therefore continually under the influence of groundwater. Sewers in the community of Marina Hill North are mostly at elevations above the groundwater table and should not be affected by significant rates of infiltration.

Groundwater levels in College Park East are also known to be high (10-15 feet amsl). Some of the sewers in this area are also located within the groundwater zone and subject to high levels of infiltration.

2-6 CLIMATE

The climate in the area is typical of Southern California with generally mild temperatures, virtually no days below freezing, and approximately 340 days of sunshine per year. The average annual rainfall in the City is approximately 11 inches. Most of the rainfall occurs between the months of November and March.

2-7 POPULATION

Population estimates for the service area were based upon information from the Center for Demographic Research at California State University, Fullerton. These population projections take into consideration national, state, and local trends, as well as land use and immigration policies.

Since its incorporation in 1915, the City of Seal Beach has grown from a population of 250 to one of over 24,000. The Center for Demographic Research estimates that the total City population will increase to 24,824 by the year 2040. Total City population projections are listed in Table 2-2.

The modest increase in population seen in Table 2-2 is due to the future residential development planned for the Hellman Ranch and old Department of Water and Power property southwesterly of Marina Drive and First Street, and the increase in net allowable densities in the existing developed areas at ultimate build-out.

Table 2-2
City of Seal Beach Population Estimates

Year	Population	Annual % Growth
2010	24,168	---
2015	24,581	1.71
2020	24,585	0.00
2025	24,799	0.87
2030	24,846	0.19
2040	24,824	-0.08

**Ref: California State Fullerton Center for Demographic Research*

The service area population was calculated from data collected from census tract numbers 995.02, 995.04, 995.11, 995.12, and 1100.12. It excludes the Leisure World Retirement Community, the College Park West Area and Surfside. A small tract of homes located in the northeast corner of College Park East, which is part of the City of Los Alamitos, is also included. The 2010 sewer service area population is estimated at 14,604 persons based on 2010 Census data. Like the total City population, the sewer service area population is not expected to increase significantly over the planning period of this study.

2-8 LAND USE

The land use information utilized in the preparation of this update of the Sewer System Master Plan was obtained from City's GIS.

Excluding the open space lying within the boundary of the Naval Weapons Station, the City is approximately 98 percent developed, or proposed for development, with a mix of residential, commercial, industrial and public land uses. The service area covers approximately 1,705 acres of the City's 7,551 acre area. This does not include College Park West, Leisure World, Rossmoor, Surfside, and most of the U.S. Naval Weapons Station. Land use designations for the City service area are shown on Figure 2-3.

City of Los Alamitos

City of Garden Grove

City of Long Beach

San Diego (405) Fwy

U.S. NAVAL

Westminster Blvd

Bolsa Chica Rd

City of Westminster

WEAPONS

STATION

Seal Beach Blvd

NATIONAL WILDLIFE REFUGE

Pacific Coast Hwy

Bolsa Chica Rd

City of Huntington Beach

Pacific Ocean

Legend

- Residential Low Density
- Residential Medium Density
- Residential High Density
- Light Commercial
- General Commercial
- Service Commercial
- Main Street Specific Plan (Commercial)
- Light Manufacturing
- Oil Extraction
- Public Use
- Golf Course
- Open Space
- Specific Plan Regulatory Zone (currently vacant)
- Not in City Service Area
- City Boundary

N

0 1,500 3,000 6,000 Feet

CITY OF SEAL BEACH
SEWER MASTER PLAN

PROJECT NO: 0801380.00

DATE: February 2018

Existing Land Use

Figure 2-3

Land use throughout the service area is predominantly residential. Low density residential zoning is found in the areas known as Hellman Ranch (Heron Point), College Park East, the Gold Coast area of Old Town, and Marina Hill. Medium and high density residential uses are located in Bridgeport and Old Town. The land uses by sewershed area are shown in Table 2-3.

Table 2-3
Existing Land Use

Sewershed		Land Use Area (Acres)														Total Area (Acres)
		RLD	RMD	RHD	L-C	C-2	C-1	MSSP	M-1	O-E	PLU	BIX	OS	SPR	ROW	
1	Pump Station 35															
	Bridgeport	14.5		22.3		5.2				4.3	2.9				20.3	69.5
	Marina Hill (south)	21.0					7.9				13.7				17.8	60.5
	Marina Hill (north)	110.2				0.9									43.6	154.7
	Old Town	9.1	17.2	89.3	4.0	6.3	0.2	13.4			14.0		9.4		150.9	314.0
	U.S. Naval Weapons Station										237.4		71.0		22.5	330.9
2	Adolfo Lopez Pump Station	12.6							27.9		5.8		15.4		15.4	77.2
3	Boeing Pump Station					7.5			70.9				0.9		17.9	97.1
4	Aquatic Park Pump Station										48.3				0.0	48.3
5	College Park East/Lampson*	216.5	7.2			32.6					3.3	157.6	1.4		89.5	508.0
6	Old Ranch Towne Center					26.1									1.0	27.1
7	Centex Homes	9.8				0.8							2.2		4.7	17.4
	Total	**393.7**	**24.4**	**111.6**	**4.0**	**67.1**	**8.1**	**13.4**	**95.1**	**4.3**	**298.8**	**157.6**	**69.5**	**0.6**	**283.5**	**1,705**

**Includes small area outside of City boundary*

RLD	Residential Low Density
RMD	Residential Medium Density
RHD	Residential High Density
L-C	Light Commercial
C-2	General Commercial
C-1	Service Commercial
MSSP	Main Street Specific Plan (Commercial)
M-1	Light Manufacturing
O-E	Oil Extraction
PLU	Public Use
BIX	Golf Course
OS	Open Space
SPR	Specific Plan Regulatory Zone (currently vacant)
ROW	Public Right-of-Ways

SECTION 3
CRITERIA

3-1 GENERAL

Establishing performance standards is an important part of evaluating the existing wastewater collection system, as it forms the basis for most of the system improvement recommendations. These standards include methodology for estimating wastewater flows, and minimum design standards for the collection system pipes, pump stations and force mains.

Average dry weather wastewater flows can be reasonably estimated from land use and unit flow factors, with the results then compared to measured flows. The components used to estimate design wastewater flows include unit flow factors, peaking factors, and infiltration/inflow allowances.

Collection system design standards include minimum pipe size, minimum flow velocity, and depth of flow to pipe diameter ratio. Pump station criteria includes sizing requirements for pumps, wet wells and forcemains. It also includes provisions for redundancy, emergency storage, emergency power, and remote monitoring and control.

3-2 UNIT FLOW FACTORS

Previous Master Plan studies developed unit flow factors for the various land uses within the City's service area. These unit flow factors, shown in Table 3-1, were developed from flow monitoring data, flow records at Pump Station No. 35, water meter records, and the census data provided in the City's General Plan. The Orange County Sanitation District (OCSD) recommended wastewater flow generation factors were used for manufacturing and public recreation land uses.

For this Master Plan study, the sewage loads utilized in the hydraulic model were based on the average FY 2014-2015 pump flow data at all sewer pump stations. This data was compiled from weekly meter readings recorded by City staff.

Current sewage loads are significantly lower than the previously estimated loads developed using unit flow factors and land use information.

Table 3-1
Unit Flow Factors

Land Use Category		Unit Flow Factor	
Use	Description	gpd/Ac	gpd/du
RHD	Residential High Density	4,000	160
RMD	Residential Medium Density	3,230	190
RLD - CPE, OT	Residential Low Density - College Park East, Old Town	1,825	225
RLD - MH	Residential Low Density - Marina Hill	1,550	225
RLD - HR	Residential Low Density - Hellman Ranch	765	300
C	Commercial	2,500	
R-G	Recreation / Grass	200	
PLU/R	Public Land Use / Recreation	200	
O-E	Oil Extraction	0	
MSSP	Main Street Specific Plan	2,500	
M-1	Light Manufacturing - Pacific Gateway	3,167	

3-3 PEAKING FACTORS

The adequacy of a sewage collection system is based upon its ability to convey peak flows. At any individual point in the system, peak dry weather flow is estimated by converting the total average dry weather flow upstream of the point in question to peak dry weather flow by an empirical relationship.

Based on flow monitoring efforts in 2005, the following empirical relationship between peak dry weather and average dry weather flow was developed for use in the system hydraulic analysis:

$$Q_{pdw} = 1.85 \times Q_{adw}^{0.92} + \text{dry weather infiltration}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{adw} = Average dry weather flow in cfs

Peak wet weather flow will be determined as follows:

$$Q_{pww} = 1.35 \times Q_{pdw}$$

Where, Q_{pdw} = Peak dry weather flow in cfs

Q_{pww} = Peak wet weather flow in cfs

3-4 INFLOW AND INFILTRATION

Inflow is the surface water that typically gains entry to the sewer system through perforated or unsealed manhole covers during rainfall events. Infiltration is defined as groundwater entering the wastewater collection system through defective pipes, pipe joints, connections, or manhole walls. Together, inflow and infiltration (I/I) can make up a substantial portion of the system loading if not properly managed. The following subsections describe the extent to which the City system is impacted by I/I.

3-4.1 INFLOW

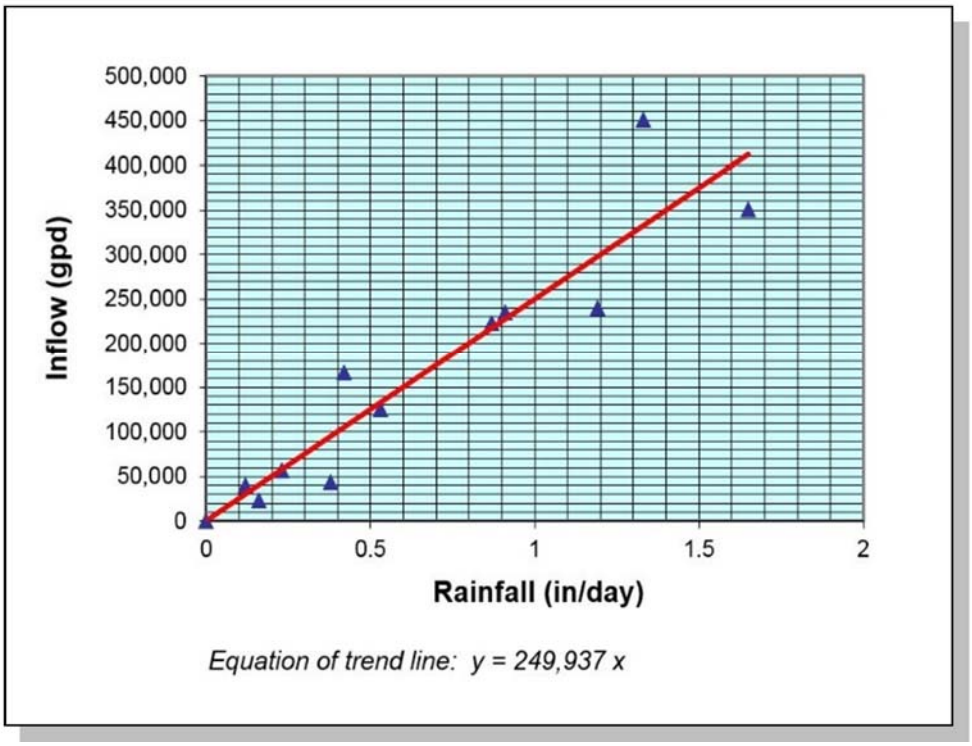
Tests have indicated that leakage through manhole covers can range from 20 to 70 gpm with a depth of 1 inch over the cover (*Clay Pipe Engineering Manual, National Clay Pipe Institute, 1990*). This could lead to a significant volume of water entering the sewer system, resulting in surcharging and increased pumping and treatment costs.

Hydrologic data and sewage flows at Pump Station No.35 during both dry and wet weather were examined during the preparation of the 1999 Master Plan to quantify the amount of inflow entering the City's sewage collection system. The Orange County Resources and Development Management Department provided daily records for rainfall from Station No. 170 (Los Alamitos), located within Seal Beach in the vicinity of Westminster Avenue and the western city boundary. The City provided total daily sewage flow records as well as the daily navy flow records at Pump Station No.35.

The wastewater flow produced by the City was determined by subtracting the US Naval Weapons Station flow from the total flow. An average flow was then calculated for the month under examination. On days in which a rainfall event occurred, inflow was determined by calculating the difference between the measured wastewater flow for that day and the average flow. The inflow was determined for several different rainfall events and plotted versus inches of rainfall per day. The results are displayed in Figure 3-1. Generally, the relationship can be defined as linear and the amount of inflow expected (gpd) is about 250,000 times the amount

of rainfall (in/day). This relationship was based upon sewage flows entering and leaving Pump Station No.35 only. It is assumed that the College Park East drainage area will have similar characteristics and follow the same trend as displayed above.

Figure 3-1 Pump Station No. 35 Inflow vs. Rainfall



It is seen that inflow contributes a significant amount of excess water into the system during rainfall events. According to hydrologic data taken at rainfall station No. 170, the City of Seal Beach has an average annual rainfall of 10.14 inches per year. This would amount to approximately 2.5 million gallons of inflow into the sewage collection system tributary to Pump Station No.35 each year. For an average rainfall of 0.5 inches, an increase in the sewer average dry weather flows of 20 percent can be expected for the Pump Station No.35 service area and 33 percent for the College Park East area. Identifying reaches where manholes are most likely to be inundated with storm water and then taking steps to either relocate or seal these manholes can reduce the volume of inflow. This would include manholes located in the vicinity of gutters and other flow paths of storm water, and sump areas that experience ponding.

The City of Seal Beach is relatively flat, especially in the areas of Old Town and College Park East where there have been problems with water ponding in streets and alleys. Historically, the City has reported flooding in Old Town at the following locations:

- First Street between Marina Drive and PCH, including Seal Beach Mobile Home Park
- 7th Street and Marina Drive
- 2nd Street and Marina Drive
- Corsair Way east of Caravel Way
- Clipper Way east of Caravel Way
- 15th, 16th, and 17th Streets between Electric Avenue and Landing Avenue

- The north side of Electric Avenue from 12th Street to Seal Beach Boulevard
- Seal Beach Boulevard south of Pacific Coast Highway
- Near the beach between 8th Street and 11th Street, especially the beach parking lot located at 10th Street

The majority of sewer manholes in Old Town are located in the center of back alleys lying directly in the path of stormwater runoff. College Park East is extremely flat, causing water to pond nearly throughout the area.

To reduce inflow into the wastewater collection system, the City has made several improvements to the storm drain system that will reduce flooding instances, particularly along Electric Avenue and in College Park East. Other activities that could further reduce inflow include installing new manhole covers which have one vent hole and one pick hole, or cover some of the existing manhole cover openings with plugs.

3.4-2 INFILTRATION

A significant portion of the sewer system is subject to infiltration due to the high groundwater levels in many parts of the City and the age of the pipelines, many of which are over 40 years old.

The City reports that infiltration into manholes is clearly visible in College Park East. The CCTV inspections conducted in 2013 showed infiltration in a number of reaches in both Old Town and College Park East. In 2005, a comparison of flow monitoring results and water meter records also indicated that the magnitude of infiltration in College Park East was about 375 gallons per acre per day. Using the same methodology, infiltration in Bridgeport and the portions of Old Town with deeper sewers is estimated at 850 gallons per acre per day.

The flow monitoring data collected for the previous Master Plan study are now quite dated. It is therefore recommended that the City re-evaluate the magnitude of current infiltration rates in College Park East, Old Town, and Bridgeport. This could be accomplished through a separate study which compares a current flow monitoring effort to water meter use data. Ideally, this flow monitoring effort should be performed at a time of year when outdoor water use is minimized. Results from this study could be used to increase the accuracy of the hydraulic model by specifically identifying the locations where infiltration is occurring, as well as the quantities involved.

3-5 SEWER SYSTEM PERFORMANCE EVALUATION CRITERIA

Sewer system performance evaluation criteria are established to ensure that the wastewater collection system can operate effectively. Each pipe segment must be capable of carrying design peak wet weather flows without surcharging the system. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

3-5.1 PIPE SIZES AND VELOCITIES

At a minimum, all pipes should be 8 inches or larger in diameter and the velocity of flow in the pipe should be greater than 2 ft/s during average flow conditions. This velocity will prevent deposition of solids in the sewer. A minimum velocity of 3 ft/sec is required during peak dry weather flow conditions, to resuspend any materials which may have already settled in the pipe. The minimum corresponding slope for various pipe sizes is presented in Table 3-2.

Table 3-2
Minimum Sewer Slopes

Pipe Size (in)	Minimum Slope
8*	0.0075
10*	0.0056
12*	0.0044
15*	0.0032
18**	0.0021
21**	0.0017
24**	0.0014

** 0.50 full with peak dry weather flow*
** *0.64 Full with peak dry weather flow*

It is important to note that the slopes listed in Table 3-2 assume the depth of flow to pipe diameter ratio to be 0.50 or 0.64. If there is insufficient flow to create this condition, greater slopes than those shown may be required.

3-5.2 FLOW DEPTH TO PIPE DIAMETER RATIOS

The design and analysis of collection system pipes is typically based upon the depth of flow to diameter ratio (d/D). All new pipe should be designed with a peak dry weather depth of flow to pipe diameter ratio less than or equal to 0.50 for 15-inch and smaller pipes, and 0.64 for 18-inch and larger pipes. The remaining pipeline capacity is reserved for wet weather related inflow and infiltration into the system. Additionally, the area above the water surface helps to keep the sewage aerated, preventing septic conditions and resulting odors. The peak wet weather depth of flow to pipe diameter ratio should not exceed 0.80.

Sewer system performance evaluation criteria are summarized in Table 3-3. Additional design criteria details are included in the “City of Seal Beach Design Criteria for Sewer Facilities”.

3-6 SEWER PUMP STATION PERFORMANCE EVALUATION CRITERIA

The performance of a sewer pump station is of particular importance since a failure could have far reaching ramifications. It must therefore be reliable, sized with sufficient capacity, and contain redundant and/or backup equipment. A plan must also be in place so that appropriate staff can be notified in the event of a failure.

The primary components of a sewer pump station are the wet well, pumps, dry well, force main, and electrical controls.

The wet well stores the incoming wastewater until a pump is activated to discharge it. It should be designed with sufficient capacity to prevent short cycles whereby the pumps continually start and stop, yet small enough that it will be regularly evacuated to prevent the wastewater from becoming septic. The desired number of pump cycles should be limited to no more than six (6) per hour for motors up to 20 HP, and less for larger motors.

The pumps should be sized to efficiently handle peak flows. A minimum of two pumps sized at the peak flow to the station should be provided so that sufficient standby capacity is available when one pump is removed for repairs. The pumps should be able to pass a minimum solid size of 3 inches without clogging. The shafts, seals and impellers should be constructed of wear resistant material to provide long life. Tungsten Carbide seals, Ni-Hard impellers, and 316 stainless steel pump shafts are recommended. For services where aggressive agents may be found in the sewage, such as at golf courses, complete stainless steel construction is recommended. This includes the pump bowl, shaft, impeller, and motor housing.

The dry well houses the valves, pumps, motors and electrical controls. It must be well ventilated and provide unobstructed access to all equipment. A minimum 3-foot clearance from all obstructions should be provided. Greater clearances may be required for equipment with special maintenance needs. Facilities for equipment removal, including hatches, large door openings, and hoists, should also be provided.

The force mains should be selected to operate within a 3 feet per second to 5 feet per second velocity range, but should not be smaller than 4-inches in diameter.

While submersible pump stations may be utilized for the small flows, the larger pump stations should be the wet well/dry type. They should be designed with easy access to all equipment. Wet wells of wastewater pumping stations are classified by the National Electric Code as Class I, Group D, Division 1 facilities if ventilated at less than 12 air changes per hour and Division 2 if continuously ventilated at 12 or more air changes per hour. Dry wells, which are physically separated from wet wells, if ventilated at less than 12 air changes per hour, are classified as Class I, Group D, Division 2 locations. Wet wells and under certain circumstances dry wells, should be considered confined spaces and should be entered in accordance with the corresponding requirements of Occupational Safety and Health Administration (OSHA).

All pump stations should incorporate redundant control systems for operation of the pumps. A float system should be used as a backup for a primary control system that utilizes an ultrasonic device or a bubbler.

Telemetry equipment (dialer) must be provided at all pump stations. The dialer notifies personnel when an alarm or failed condition occurs. The dialer must be capable of calling several pre-programmed numbers until the alarm is acknowledged by an operator. The dialer can also be used to remotely check the status of the station if desired.

While pump stations may be necessary to serve portions of the City's service area because of topographic requirements, all feasible efforts should be made to eliminate their use. In evaluating the feasibility of constructing a pump station, a detailed comparison with a gravity alternative should be made. The service lives of the two facilities, the cost of operation and maintenance, as well as the many problems associated with the development of flows during the first several years should be carefully considered.

Sewer pump station performance evaluation criteria are summarized in Table 3-3.

Table 3-3

Sewer System Performance Evaluation Criteria

Collection System	
Minimum Pipe Size	8-inch
Minimum Velocity	2.0 fps at average flow or;
	3.0 fps at peak flow
Flow Depth to Pipe Diameter Ratio (d/D) with Peak Dry Weather Flows	
15-inch and under	0.5
18-inch and over	0.64
Pump Station	
Pumps	▪ Minimum 2 each sized at peak flow
	▪ Minimum solids handling capacity 3”
Wet Wells	▪ Sized to limit pump cycling to less than 6 times/hr for motor HP up to 20; 4 times/hr up to 50 HP; 3 times/hr up to 75 HP; 2 times/hr 100 HP and above
	▪ Provide 30 minutes of storage at peak flow to allow response to a failure
	▪ Equipment to be maintained must be accessible without entering the structure
Ventilation	▪ 12-air changes/hour minimum in dry well and as required by NFPA 820
Controls	Redundant system. Float operated back-up controls
Emergency Power	Stationary source in locations which cannot provide 30-minute response time without overflowing. Provisions for connection of a portable power source at all other locations
Telemetry	Dialer system at all pump stations to alert personnel in the event of a station failure
Force Mains	▪ Minimum velocity 3.0 ft/sec
	▪ Minimum size 4”
	▪ Air/Vacs installed in vaults

3-7 SERVICE LIFE OF PIPE AND PUMP STATION EQUIPMENT

In addition to the design criteria discussed in previous sections, the useful lives for which one can expect relatively trouble-free service is also of great importance when assessing an existing or future sewer system. Once the service life of a facility is exceeded, it becomes subject to failure and is often expensive to maintain. The determination of useful life can be difficult and depends on many different considerations including the following:

- Type of materials used and recorded performance of similar installations
- Velocities and flow rates expected in the system
- Chemical and biological conditions of the wastewater
- Construction methods and installation

However, the values listed in Table 3-4 are generally accepted as prudent planning criteria and are used as benchmarks for replacement recommendations in this study.

Table 3-4
Planning Criteria for Facility Useful Life

Facility	Description	Useful Life (Yrs.)
Gravity Sewers	Cast Iron Pipe (cip)	20
	Plastic Pipe	70
	Vitrified Clay Pipe (VCP)	70
Force Mains	Asbestos-Cement Pipe (acp)	40
	Ductile Iron Pipe (dip)	40
	Plastic Pipe	30
Pump Stations	Structure	60
	Piping	30
	Valving	20
	Mechanical	15
	Electrical	15

SECTION 4
EXISTING COLLECTION SYSTEM

4-1 GENERAL DESCRIPTION

The City's existing wastewater collection system is made up of a network of gravity sewers, pump stations, and sewer force mains. The gravity system consists of approximately 181,000 feet of pipe and 800 manholes serving about 5000 customers. The majority of the gravity sewers are constructed of vitrified clay pipe with sizes ranging from 6-inches to 24-inches in diameter. There are six existing pump stations and associated force mains maintained by the City. These facilities are discussed in detail in Section 6.

Originally, the City maintained a trunk sewer in Electric Avenue that conveyed wastewater flows northwesterly to a local wastewater treatment plant at the northwestern border of the City. In 1973, the treatment plant was demolished and Pump Station No. 35 was constructed at the southeast end of Electric Avenue. A new 21-inch to 24-inch diameter interceptor, also in Electric Avenue, was constructed to convey wastewater in the opposite direction towards Pump Station No. 35.

Currently, the gravity trunk sewer in Electric Avenue collects wastewater from the areas of Bridgeport, Marina Hill, and Old Town, and transports it southeast to Pump Station No. 35. Wastewater from the U.S. Naval Weapons Station flows directly into Pump Station No. 35 from the east as well.

Wastewater is then pumped from Pump Station No. 35 north via a 16-inch force main in Seal Beach Boulevard to a high point in the road. The wastewater then enters the existing 24-inch Seal Beach Boulevard Trunk Sewer which terminates at OCSD's Seal Beach Pump Station, located on the northeast corner of Westminster Avenue and Seal Beach Boulevard. Flows from the Adolfo Lopez Pump Station and Boeing Pump Station are also discharged into the 24-inch Seal Beach Boulevard Trunk Sewer.

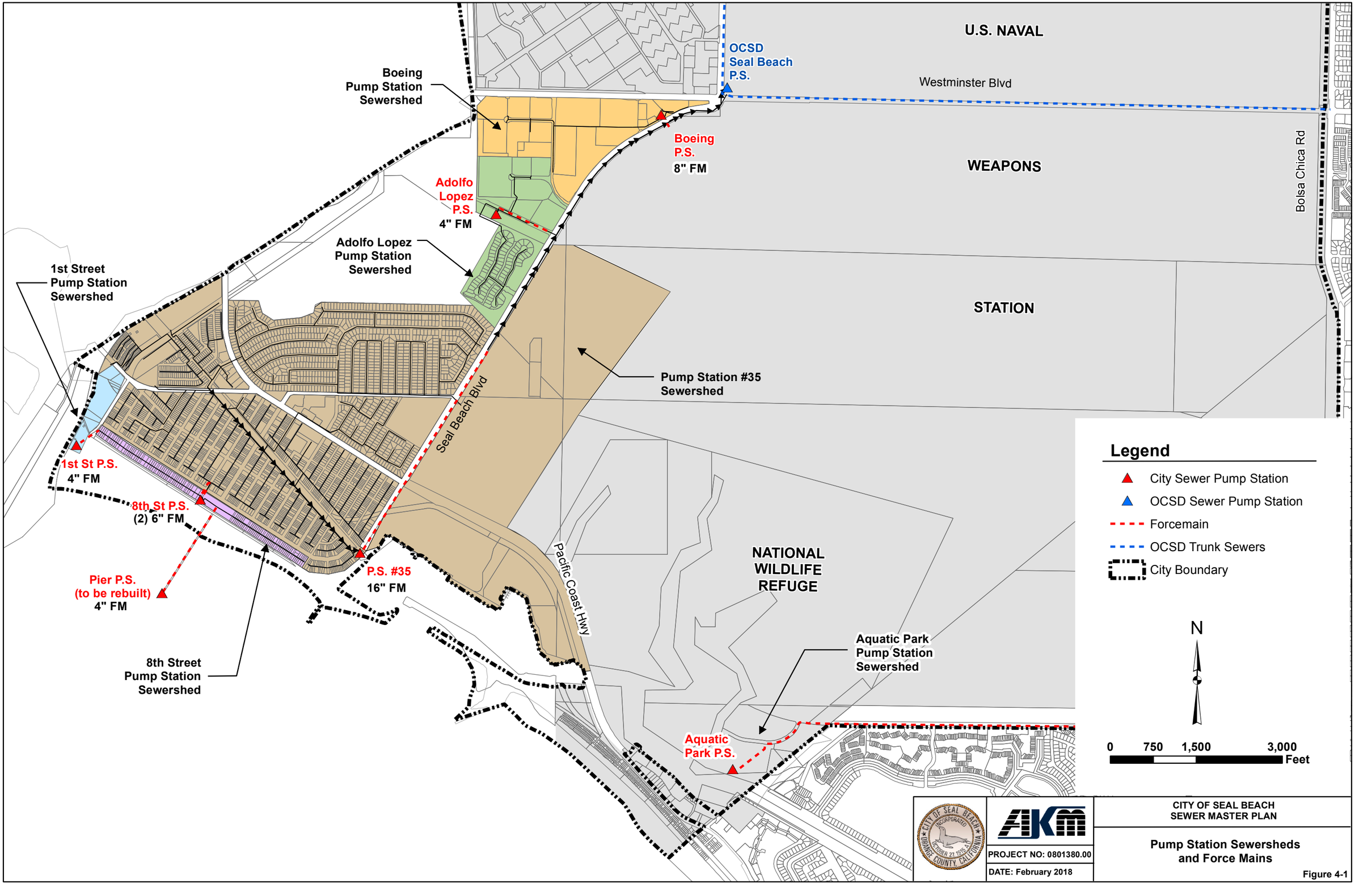
The system of sewers in College Park East community conveys the wastewater to the existing 15-inch VCP Lampson Avenue Trunk Sewer, which extends from Basswood Street to Seal Beach Boulevard. This sewer increases to 18-inches in diameter at Seal Beach Boulevard before entering OCSD's 30-inch diameter VCP Los Alamitos Sub-Trunk Sewer located on the west side of Seal Beach Boulevard. The Los Alamitos Sub-Trunk sewer terminates at OCSD's Westside Pump Station located between Yellowtail Drive and Bixby Storm Channel.

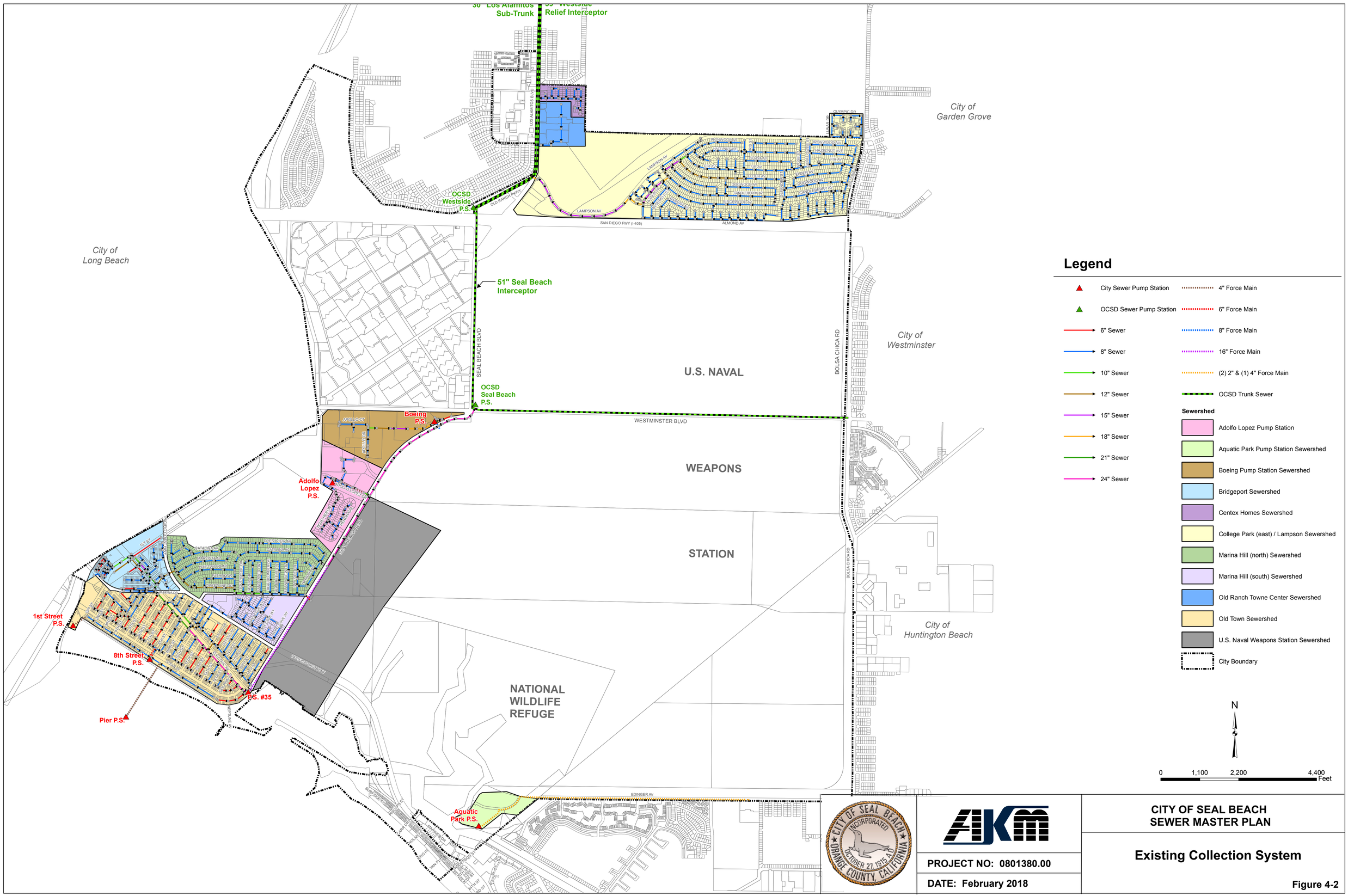
4-2 DRAINAGE REGIONS (SEWERSHEDS)

The City's sewer service area consists of seven major sewersheds as shown in Table 4-1 and on Figure 4-1. The existing wastewater collection system as currently maintained by the City of Seal Beach is shown on Figure 4-2.

Table 4-1
Major Sewersheds

1	Pump Station No 35
	Bridgeport
	Marina Hill North
	Marina Hill South
	Old Town
	U.S. Naval Weapons Station
2	Adolfo Lopez Pump Station
3	Boeing Pump Station
4	Aquatic Park Pump Station
5	College Park East
6	Old Ranch Towne Center
7	Centex Homes


U.S. NAVAL
WEAPONS
STATION
NATIONAL WILDLIFE REFUGE
Westminster Blvd
Bolsa Chica Rd
Seal Beach Blvd
Pacific Coast Hwy
OCSD Seal Beach P.S.
Boeing Pump Station Sewershed
Boeing P.S. 8" FM
Adolfo Lopez P.S. 4" FM
Adolfo Lopez Pump Station Sewershed
1st Street Pump Station Sewershed
1st St P.S. 4" FM
8th St P.S. (2) 6" FM
Pier P.S. (to be rebuilt) 4" FM
8th Street Pump Station Sewershed
P.S. #35 16" FM
Pump Station #35 Sewershed
Aquatic Park Pump Station Sewershed
Aquatic Park P.S.
Legend
City Sewer Pump Station
OCSD Sewer Pump Station
Forcemain
OCSD Trunk Sewers
City Boundary
N
0 750 1,500 3,000
Feet
CITY OF SEAL BEACH
SEWER MASTER PLAN
PROJECT NO: 0801380.00
DATE: February 2018
Pump Station Sewersheds and Force Mains
Figure 4-1



CITY OF SEAL BEACH
SEWER MASTER PLAN

Existing Collection System

PROJECT NO: 0801380.00

DATE: February 2018

Figure 4-2

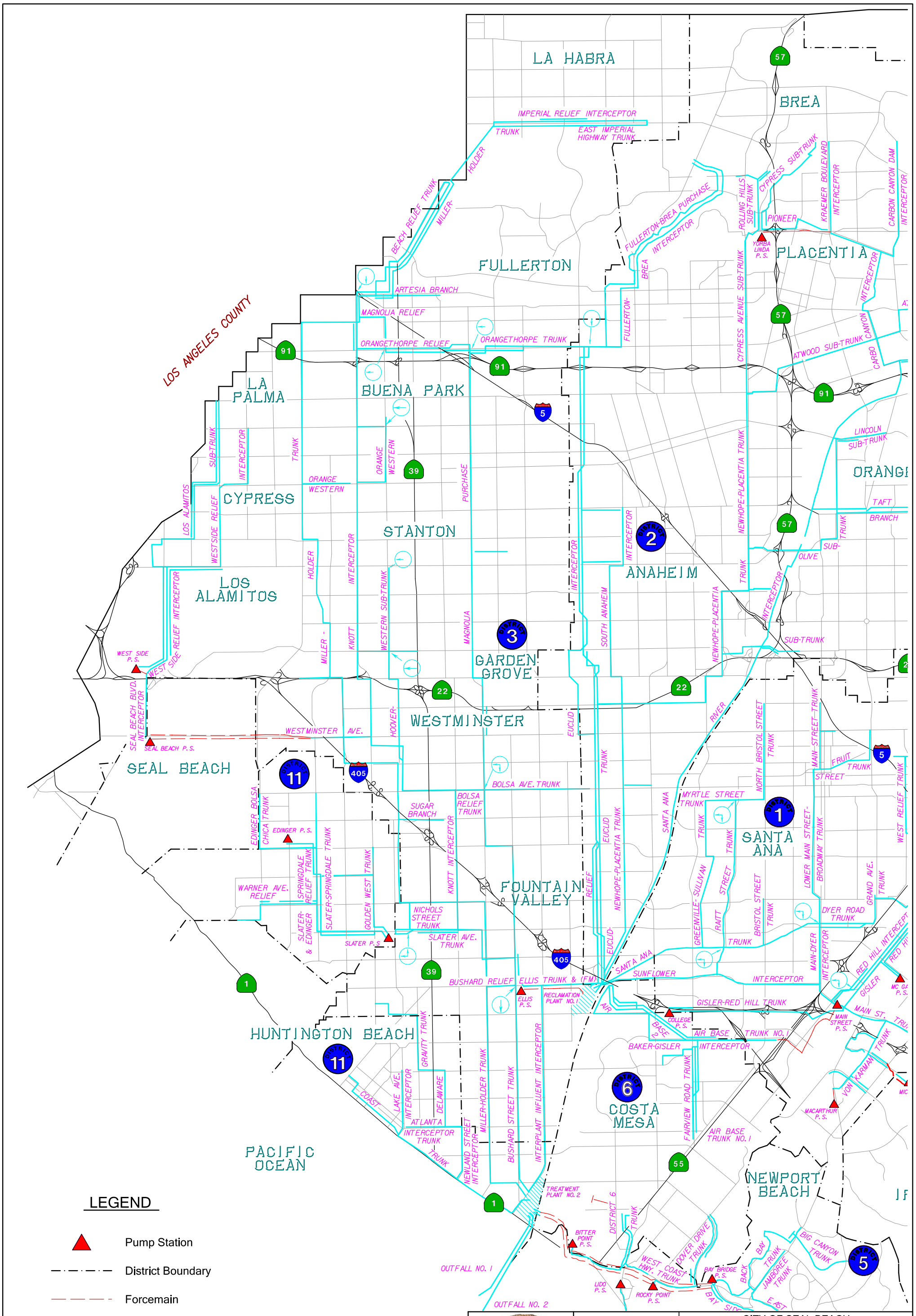
4-3 ORANGE COUNTY SANITATION DISTRICT (OCSD) WASTEWATER COLLECTION SYSTEM

The City of Seal Beach is a part of Orange County Sanitation District's (OCSD) Revenue Area No. 3. The City's wastewater collection system ultimately conveys sewage to one of two OCSD pump stations. Sewage collected at Pump Station No. 35 is conveyed northeast in Seal Beach Boulevard via a 16-inch diameter force main and a 24-inch diameter gravity sewer to OCSD's Seal Beach Pump Station, located on the northeast corner of Seal Beach Boulevard and Westminster Avenue. The wastewater collected at the City's Boeing and Adolfo Lopez Pump Stations are also pumped to the 24-inch diameter trunk sewer in Seal Beach Boulevard, terminating at the Seal Beach Pump Station. Flows from College Park East, Old Ranch Golf Course, and commercial area east of Seal Beach Boulevard and south of Lampson Avenue discharge into OCSD's 30-inch diameter Los Alamitos Sub-trunk sewer in Seal Beach Boulevard. This facility carries the wastewater to OCSD's Westside Pump Station, located at 3112 Yellowtail Drive just north of the San Diego Freeway.

The Westside Pump Station has a 20-inch diameter force main that discharges to the Seal Beach Interceptor. This is a 51-inch reinforced concrete pipe in Seal Beach Boulevard that transports flows south to the Seal Beach Pump Station. The Seal Beach Pump Station then takes the flows it receives from the Seal Beach Interceptor and Pump Station No. 35, and lifts it into the Westminster Avenue Interceptor.

The Westminster Avenue Interceptor conveys the flow east from the Seal Beach Pump Station to a connection with OCSD's Knott Trunk Sewer System (KTSS) at the intersection of Westminster Avenue and Golden West Street. The KTSS is one of four major sewer trunk lines serving the western portion of Orange County. The KTSS begins in Fullerton at the intersection of Knott Avenue and Artesia Street and terminates at OCSD's Treatment Plant No. 2, located in the City of Huntington Beach next to the Santa Ana River and east of Pacific Coast Highway.

The unit operations at Treatment Plant No. 2 include: screening, grit removal, primary clarification, aeration, secondary clarification, and disinfection. Treated effluent is disposed of through an ocean outfall system. Figure 4-3 shows the locations of OCSD's trunk lines, pump stations, and treatment plants.



CITY OF SEAL BEACH
SEWER MASTER PLAN

Orange County Sanitation District
Collection System

PROJECT No. 0801380.00

DATE: February 2018

FIGURE 4-3